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TABLE OF CONTENTS.

VOLUME IV.

ORIGINAL COMMUNICATIONS:—

ORIGINAL COMMUNICATIONS.

I.—*The Coffee Bug and Coffee Mildew.*

THE following extracts are from an official report on the state of Ceylon, communicated to the Society by Earl Grey. They show the existence on that island of two formidable enemies to gardeners: the one a scale insect, the other a mildew plant, which may possibly visit our shores; fragments of the plant, or of an allied species, having been already detected in this country, as is stated by the Rev. Mr. Berkeley, in the valuable report which he has contributed upon the subject (see p. 7).

Extracts from a Report by George Gardner, Esq., on the Coffee Blight of Ceylon, addressed to the Secretary to Government.

"SIR, "Royal Botanic Gardens, Peradenia, July 4, 1848.

"Agreeably to the instructions contained in your letter to me of the 12th ultimo, I have the honour to inform you that I have visited the coffee districts therein mentioned, and collected such information as I have been able regarding the nature, history, and effects of the 'brown scale.' or 'bug,' which for some years past has been infesting the coffee estates of the central province; and now beg leave to lay before you, for the information of his Excellency the Governor, the following report:—

"As it would be impossible to understand thoroughly the effects which the insect produces, without having a knowledge of its structure and functions, I shall, in the first instance, detail these, at least so much of them as I have been able to determine.

"The first thing that attracts one's attention on looking at a coffee-tree which has for some time been infested with the 'bug,' is the number of brownish-coloured wart-like bodies that stud the young shoots, and occasionally the margins of the under side of the leaves. Each of these warts or scales is a transformed female 'bug,' containing a large number of eggs which are hatched within it. When the young ones come out from their nest they run about over the plant, looking very much like small woodlice, and at this period of their lives there is no distinction between the male and the female.

"Shortly after being hatched the males generally seek the under side of the leaves, while the females prefer the young shoots as a place of abode. In these localities they attach them-

selves to the cuticle of the plant, for the purpose of undergoing certain transformations, which, being different in the two sexes, will require to be described separately.

"If the under surface of a young leaf of an infected coffee-tree be examined with the naked eye, it will be found to be studded, particularly on its lower half, with a number of minute yellowish white-coloured specks of an oblong form. These are the *larvæ* of the males being transformed into *pupæ* beneath their own skin. Some of these specks are always in a more perfect state than others, the full-grown ones being of a whitish colour, and scarcely a line long. Of those which are of this size, some have a much more translucent appearance than others; and if examined with a magnifier, will be found to be empty, the perfect animal having made its escape from it; but if the darker coloured ones are examined in the same manner, the nearly perfect insect will be found within it. In this state the animal is of an oblong form, of a yellowish colour, with the rudiment of a wing on each side attached to the lower part of the thorax, and closely applied to the sides. It has six legs, the four hind ones being directed backwards, and the two anterior ones forwards. It has two antennæ, which are directed backwards, and from the tail protrude three short bristles, the middle one of which is both thicker and larger than the other two.

"When the transformation has been completed, and the insect has reached its maturity, it makes its way out from beneath the pellucid case by which it was covered. All its organs have then reached their full size. The head is somewhat of a globular form, with two rather prominent black eyes in front, and two long antennæ, each with 11 joints, hairy throughout, and with a tuft of a few longer hairs at their apices. The legs are also hairy. The wings are horizontal, of an obovate oblong shape, membranous, and a little longer than the bristles of the tail. They have only two nerves, neither of which reaches so far as the tips. One of them runs close to the external margin, and is much thicker than the other, which runs at some distance from the internal margin. Being possessed of wings, the full-grown male is much less seldom seen on the coffee bushes than the female.

"The female, like the male, attaches herself to the surface of the plant, the place selected being usually the young shoots, but she is also to be met with on the margins of the under side of the leaves. On the upper surface neither male nor female ever attach themselves. But unlike the male, which derives no nourishment from the juices of the plant, the female, as soon as she has fixed herself, punctures the cuticle with a proboscis which she has on her chest, and by which she abstracts the juices that nourish her. In the early pupa state of the female she is easily

distinguished from the male, by being more elliptical, and much more convex.

"As she increases in size the skin extends and becomes smooth and dry, the rings of the body become effaced, and losing entirely the form of an insect, she has for some time a yellowish pustule-like shape, but ultimately becomes of a roundish-conical form, and of a dark-brown colour. Until she has reached nearly her full size, she still possesses the power of locomotion, and her six feet are easily distinguishable on the under surface of her corpulent body; but at no period of her existence has she wings.

"It is about the period of attaining her full size that impregnation takes place, after which the scale becomes somewhat more conical, assumes a darker colour, and, at length, is permanently fixed to the surface of the plant by means of a cottony substance interposed between it and the cuticle to which it adheres.

"The scale, when full grown, exactly resembles in miniature the hat of a Cornish miner, there being a narrow rim at the base which gives increased surface for attachment. It is about one line and a half in diameter, by about one line deep, and appears perfectly smooth to the naked eye; but when examined with a powerful magnifier, it is found to be studded with very minute warts, which at first sight give it a dotted appearance. It is entirely destitute of hairs, except the margin of the rim, which is ciliated.

"The number of eggs contained in one of these scales is enormous, amounting in one which I counted to no less than 691. The eggs are of an oblong shape, of a pale flesh colour, and perfectly smooth. In some of the scales which I have examined, the eggs had just been hatched, and, when laid in the field of the microscope, exactly resembled those masses of life so often seen in dry old cheeses.

"The insect, I find, belongs to the genus *coccus*, and is therefore a congener of that which produces the cochineal of commerce. So far as the only books within my reach enable me to judge, it seems to be the *Coccus adonidum* of Linnæus, which he mentions as being common on evergreen trees in Asia, such as the camellia, &c. He gives no description of the male, but his character of the female agrees pretty well with the coffee one, except in being less conical in the scale state. If not the same, it is a very nearly allied species.

"It is not till after the pest has been on an estate for two or three years that it shows itself to any alarming extent. During the first year only a few of the ripe scales are seen scattered over the bushes, generally on the younger shoots, sometimes on the margins of the under side of the leaves; but, should the trees be in bearing, most commonly on the footstalks of the berries. The crop this season does not suffer much, and the ap-

B 2

pearance of the tree is scarcely altered: the following year, however, brings a change for the worse with it. The scales are found to have become more numerous, and if the young shoots and the under side of the leaves are examined, they will be found to be covered with numberless white specks, which prove to be the young scales in a more or less forward state. The clusters of berries have assumed a black, smutty appearance; have a more numerous crop of scales than during the previous year; and, if the clusters are watched, it will be found that a number of their berries fall off before coming to maturity. The general health of the tree now also begins to fail, and it acquires a blighted appearance: a loss of crop is sustained, but not to any extent.

"The third year brings about a still greater change. The whole plant has then assumed a deep black colour, having all the appearance of soot having been thrown over it in great quantities. This colour is caused by the growth of a black parasitic fungus on the young shoots, and the upper surfaces of the leaves, where it forms a thin fibrous coating, not unlike a piece of velvet or felt. When this substance is examined with a powerful microscope, it is found to consist of a dense interlaced mesh of fibres, each made up of a single series of minute oblong vesicles applied end to end. It never makes its appearance on the tree till after the *coccus* or 'bug' has been a long time on it, and is no doubt produced by the unhealthy state to which the plant has been reduced, owing to the vitiation of its juices by the insect. As certainly as the scale never appears on the upper surface of the leaf, so surely does the fungus never appear on the under one.

"At this period the young shoots have an exceedingly disgusting look, from the dense mass of yellowish pustule-like scales that are forming on them. The leaves, in consequence of the abstraction of their juices alike by the animal and the vegetable parasite, become shrivelled and evidently diminished in size; and the trees, which, in their healthy state, appeared to cover the ground, now seem to stand out singly. On the best trees thus infested, more than two-thirds of the crop are lost, and, on many, scarcely a berry is to be seen.

"Besides the 'scale,' there is another species of *coccus* sometimes found on coffee-trees, but never to the same extent as the other. The female of this kind never changes into a scale, but wraps herself up in a white cottony matter after impregnation, and there producing her eggs, dies. It has sometimes been observed on coffee estates previous to the appearance of the scale, but there is evidently no connexion between them.

"So far as I have been able to ascertain, the coffee trees of the island were never affected with the 'scale' till the year

1843, when Captain Robertson first observed it on a few coffee bushes on his estate called Lapallagalla. This estate, together with a few others, is situated immediately on the western boundary of the great central mountain range overlooking the country of the Four Korles, and the tract is known by the name of the Muruta district. Since then the pest has been gradually progressing eastwards through the Dolisbagie, Ambegamoa, Kotmalee, Pusilava, Deltotte, Hunisgiria, and Knuckles districts; but having only appeared within the last two years in the latter places, its ravages have not yet reached to the same extent in them as in the former ones.

"The cause of the first appearance of the 'scale' on coffee bushes I found to be variously accounted for. Captain Robertson's neighbours attribute its first introduction to the island to his having imported it on some Mocha coffee plants that he brought from Bombay. The superintendent of one of the estates near to Captain Robertson's having first seen it on some vigorous plants near the Coolie lines, ascribed its production to the rich manure supplied by the Coolies. Others, such as Mr. Anstruther, believe it to be spontaneous in its origin, and that bad planting, allowing water to accumulate about the roots of the plant, has been the original cause of its production.

"During my recent excursion it was ascertained that the coffee *coccus* now exists very abundantly on many other sorts of trees, giving them the same appearance and producing the same effect on them. Thus I have observed it on the lime, the guava, the myrtle, the rose, *Careya arborea*, and *Vitex Negundo*, the two last common roadside trees. It seems, however, very certain that until within the last five years it has not been known to attack the coffee plant. In most of the districts that I have just visited the coffee trees of the villagers were found to be quite as much affected as those in plantations. In the botanic garden at Peradenia there is scarcely a tree that is not infested to a degree. It is, therefore, scarcely possible not to believe that, had the insect been in existence in Ceylon previous to the present epidemic, its effects should not have been observed at one period or another on the native coffee.

"If, as Mr. Anstruther supposes, the nature of the soil and bad planting have anything to do with its origin, Captain Robertson's estate of Lapallagalla is one of the most likely I have seen in Ceylon to have given birth to it, or, if not that, at least to have afforded it an excellent field on which to begin its ravages. The soil of it, as well as of nearly all the surrounding estates, is of a stiff clayey nature, and consequently, the holes that were dug for the young plants must have acted like pots without outlets to contain the moisture that drained into them

from the surface; and that they must have been well supplied with moisture is certain, from the fact that the district is one of the most rainy in the island. The roots of the plants must also have found great difficulty in penetrating through the sides of the holes, and, indeed, the whole appearance of the trees shows that matters are not going on well with them at bottom. Nearly all of them have a lanky look, throw out few or no lateral shoots from their lower branches, and, on an average, only yield at the best of times from four to five cwt. of coffee per acre, or about one-half of the usual crop of average estates in other districts.

"On nearly all those estates where I have been able to trace the rise and progress of the epidemic, the *coccus* has been first observed in moist hollow places sheltered from the wind, and from thence has spread itself in all directions, even over the driest and most exposed localities. This is not, however, universal, as on a few estates, such as those of Pen-y-lan and Dakanyke, it first appeared on dry exposed places. That it prefers moist sheltered situations is certain, as, on the Lapallagalla and Muruta estates, which, about a year ago, had become nearly free of the pest, it still clung in a very obvious manner to those trees that were situated by the side of little streams of water in hollows and ravines.

"The extent of the injury caused by the epidemic was found to vary considerably in the different districts visited, but was always more or less in proportion to the length of time it had been first observed."

[Mr. Gardner describes in detail the ravages produced by the combined action of the coccus and the parasitical fungus; they were so extensive as to cause Lord Torrington to speak of them in the following words:—]

"The effects are most serious; one estate has been reported to me in which the production of a single season, which, calculated upon that of the previous one, ought to have been 2000 cwt., fell suddenly to 700 cwt., the difference being destroyed in a few months by the bug, and to the present hour no improvement has taken place in its condition. Others have been more or less unfortunate. In some the insect has disappeared partially, and partially returned; and, in some few, whence it has entirely passed away, the trees are now covered with fresh and healthy leaves and promise an abundant harvest, but unfortunately we are not in a condition to pronounce when this may not again be blighted by another visit from the bug."

[No specimens of the insect are known to have reached this country. The parasitical plant has been sent to the Rev. Mr. Berkeley, who has furnished the Society with the following interesting account of it:—]

II.—*A Notice of a Mould attacking the Coffee Plantations in Ceylon.* By the Rev. M. J. Berkeley, King's Cliffe, Wansford.

(Communicated Sept. 2, 1848.)

We are daily hearing of fresh instances of the extensive prevalence of blight and mildew in various forms in our fields and gardens at home, but it is curious that of late years intelligence has arrived of similar visitations from countries of quite a different temperature. A few days since a letter dated Peradenia, July 9th of the present year, was received from Mr. Gardner, of Ceylon, to the following effect: "I write in great haste merely to ask you to be kind enough to let me know at your earliest convenience what species of fungus the inclosed is. It is at present overrunning the greater part of the coffee estates in Ceylon. It is caused by a species of 'scale' or 'bug,' which first began to appear about five years ago, and it is not till the 'bug' has been on the trees for upwards of a year that the fungus makes its appearance."

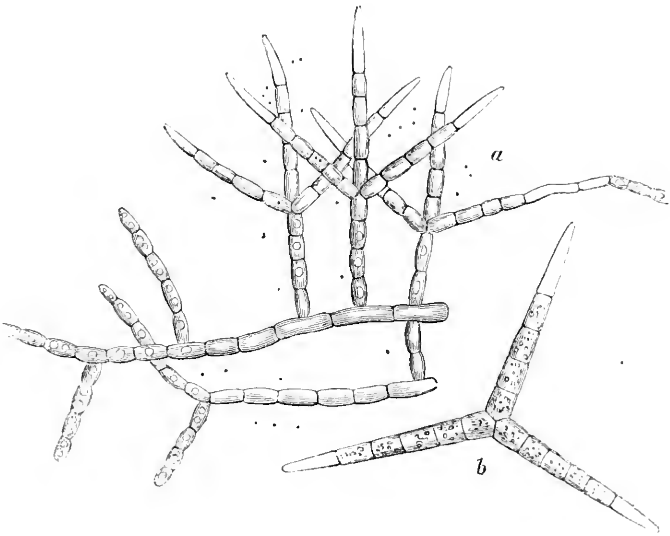
The leaves are completely covered with a black sooty wash, and the trees must be in a sad plight; for not only are they smothered with the fungus, but they are weighed down with masses of a gelatinous lichen belonging to the genus Collema or some closely allied group, which, though merely forming small radiated black specks when dry, on the application of moisture instantly swells and increases immensely in volume.

Mr. Gardner's observation that the fungus is always preceded by an insect is exactly in accordance with what often takes place in similar affections here. Nothing is more common than for orange trees and other smooth-leaved exotics to suffer from some form of Fumago, which is in every instance, I believe, preceded by a coccus, except possibly where there has been an exusion of honey-dew, and it appears that the visitation which has been so serious in the orange plantations of the Azores and Madeira has exhibited the same connexion between the plant and insect.

There is great reason to believe that many of these plagues are in the first instance imported, and we know that some vegetable productions of foreign extraction and some insects also become peculiarly luxuriant and abundant in their new quarters —a fact which will account in some instances for the sudden rise of visitations which were before unknown. Dr. Morren has stated his conviction that *Botrytis infestans*, of which so much has been heard of late years, is an importation, and the notion is at least worthy of consideration. There is a curious prejudice in the West Indies against all garden-plants, and in the sugar plantations, if the proprietor leaves, the first step

is always to destroy everything in the neighbouring garden, a custom which, though arising evidently from exaggerated fears, may not be altogether void of foundation in experience.

Mr. Gardner supposed on a mere cursory inspection that the fungus, as is the case in some other forms of Fumago, belonged to the genus Antennaria; but this is not the case, the parasite really belonging to Corda's curious genus Triposporium, a few threads of which have been found in similar cases of blight in England, but merely scattered amongst other moulds, so as not to enable me to ascertain whether the species is the same with that from Ceylon, which is however quite distinct from the original species of Corda, which has been found by Mr. Broome on oak chips near Bristol, and of which Corda has given a splendid figure in his Pracht-Flora. I subjoin a sketch and specific characters of Mr. Gardner's species.



Triposporium Gardneri, N. S.; mycelium densely interwoven, fertile threads short, spores elongated.

The figure represents at *a* a portion magnified, in which it will be seen that the spores are sometimes elongated at the apex, and proliferous; and at *b* one of the triple spores highly magnified.

III.—*Notes on the Proper Treatment of Epiphytal Orchids.* By George Gordon, A.L.S., Superintendent of the Ornamental Department in the Society's Garden.

(Communicated November, 1848.)

Perhaps no tribe of plants has attracted more notice, even from common observers, than Orchids; yet, notwithstanding this, little seems to have been understood in regard to their treatment or natural habits, until Dr. Lindley published an instructive paper on the subject many years ago in the Society's Transactions; and, although a good deal of what was then supposed to be important has since proved incorrect, more especially as to the amount of heat and moisture which should be given them, still these instructions first afforded the true principles and rules to be observed in their culture. Now, however, that the true nature and habits of Orchids are better understood, it is found that, like other plants, they require rest or repose, and that much heat and moisture together, unless judiciously given and at proper seasons, are absolutely injurious to them. The maximum of heat and moisture is only required when the plants are in a vigorous state of growth, and at no other time; but it is now pretty well understood by good cultivators, that a great variation, both in temperature and moisture, is required during the whole year, and that without it Orchids cannot be kept in perfect health and vigour for any length of time. These variations, however, must be entirely independent of such changes as take place between the day and night temperatures at any season of the year; they should agree with the variations in the climate in which the plants grow naturally, and where Orchids have at least two principal seasons, a dry season of rest, and a moist one, to grow and flower in; for heat has very little effect on them unless accompanied by moisture.

In the following observations I shall endeavour to point out the advantage of growing Orchids in a comparatively cool and dry atmosphere over the plan of keeping them, as is frequently the case, in a hot and damp climate more like that of an Indian jungle than anything else. In such a climate, the flowers, when produced, last a much shorter time in perfection, and if the plants are removed when in bloom to a cooler situation, they suffer greatly by coming in contact with a drier atmosphere. I need hardly refer to the several kinds of tender plants which flourish so well in, and decorate our flower-beds and borders in summer and autumn, in order to show how plants may be made to adapt themselves to a much lower mean temperature than that in which they are often kept, if they are properly treated and

means employed to attain that end: this fact is familiar to every one who raises tender plants in heat and afterwards hardens them so as to withstand the open air.

In the following instructions I have for convenience divided the subject into six heads:—

1st. The most suitable structures for growing Orchids in; the mode of heating and ventilating those structures; day-shading, and night covering.

2nd. Atmosphere, temperature, and effects of climate on Orchids.

3rd. Soil, time of shifting, situation in the house, watering, and propagation.

4th. Treatment when out of health or when fresh imported.

5th. How to destroy insects injurious to them.

6th. A selection of fifty of the most desirable kinds, with their time of flowering, and proper treatment, &c.

1. *The Orchid-house.*

In constructing a house for the special cultivation of Epiphytal Orchids, attention should be paid to having a thorough command over the means by which internal heat and moisture are produced, with plenty of power at all times to increase or diminish the same, for upon this much depends; as to suitableness of structure, a large or lofty house is ill adapted for Orchids, because during very hot dry weather in summer, and severe frost in winter, when strong fires are required as well as in windy and long-continued cold damp weather, at all seasons, it will be found very difficult to keep the atmosphere in a proper state, as regards either heat or moisture. But on the contrary, a small house has other objections, though not so great, such as sudden changes from drought to excess of moisture, and from heat to cold, circumstances depending in a great measure upon the state of the external atmosphere; besides, a small structure is not spacious enough for large specimen plants. I would therefore recommend a house of medium size, which should be divided into two compartments, one for Orchids from the Western hemisphere, and which naturally grow in a lower temperature and drier atmosphere; the other for Eastern varieties, which naturally require more heat and moisture, particularly when in a growing state, and also for all others when in a vigorous state of growth. In fact the different kinds, spread as they are over the tropical parts of the Eastern as well as Western hemispheres, are subjected to great variation of temperature, both as regards heat and moisture.

The house may be placed to face any direction between south-

east and south-west. It should be span-roofed, but not over wide, 14 feet high in the centre, and forming an angle not exceeding 30°, but as near as possible that pitch; there should be no upright sashes on either sides, but it should have glazed ends. The interior should be fitted up with slate stages and shelves, those in the centre having a heated chamber underneath, closed in, but with ventilators to allow the heat to escape into the house when required.

In heating nothing is better than hot water in 4-inch pipes, which should enter at the end and run round the house in a double row. The centre chamber should be heated by one flow and return pipe only. Open gutters in the house, or inside the chamber, are objectionable on account of their being incapable of producing heat without moisture, the latter being in general too plentifully supplied; for the quantity required of this as well as of heat must at all times depend upon the state of the external atmosphere.

Conical boilers are in general most efficient, when properly set; but much of their value, like that of all other kinds of boilers, depends upon their not requiring so much attendance as others. All Orchid-houses should have two boilers fitted to the pipes, in order that, if any accident happens to the one, the other may be in readiness to be used, or both together in severe frosty weather.

With regard to ventilation too much caution cannot be observed, for in no case should direct currents of cold air be allowed to enter the house: therefore the best mode of ventilation is at or near the top through the upper lights, which may be made to run down or push outwards at their lowest end, and thus allow the over-heated air to escape. The supply of fresh air required is but small, and may be admitted by small apertures (furnished with ventilators) in the front and back walls as near the ground as possible and below the hot-water pipes, so that the fresh air may be warmed in passing among and over the hot pipes.

Moisture must be obtained by occasionally pouring water over the shelves, hot-water pipes, and from small earthen evaporating-pans placed over the pipes at their hottest ends.

Shading will be found to be indispensable in bright sunshine; the necessity for this will be more apparent when it is remembered that in all hot and damp climates the sun's rays are greatly obstructed by the amount of vapour which floats in the air. Shading will also be found of great service when the external atmosphere is very hot and dry; it prevents internal evaporation from going on too quickly, and keeps the foliage of a brighter green. If Orchids are much exposed to sunshine in summer

they are sure to assume a brownish colour, which looks unhealthy; shading, however, should only be used during bright sunshine, in summer, and autumn; it should by no means be kept on for the season, as is frequently the case; on the contrary, it should be removed every afternoon to allow the plants the uninterrupted light of the evenings and mornings when the sun is not too powerful.

The best shading is strong canvas on rollers, which should be made to unrol from the bottom of the roof upwards, for frequently the lower portion of the house only requires to be shaded.

In glazing, all the laps should be made quite close, and large squares of glass should be avoided; at least wide ones, not only on account of their being liable to breakage, but if the squares are narrow less shading is required. There can be little doubt that if an Orchid-house was glazed with rough plate-glass, shading might be dispensed with altogether, or nearly so, and with advantage to the plants.

Night-covering on the outside of the house is very desirable in winter; this may easily be effected by placing a waterproof kind of canvas on the rollers which are used for the shading. The best way to prevent excessive dryness at night is to lower the temperature produced by fire-heat as much as possible; and this can only be done with safety when some external covering is used; for the temperature of the glass in the roof of a hothouse at night, when fully exposed, is exactly the mean of the external and internal air, and consequently in very cold weather and when there is moisture floating in the internal atmosphere, it becomes a great condenser, and dries the air of the house much faster than it otherwise would be. This an outer covering prevents, in a great measure, and it also tends much to obviate drip.

The plan of having climbing plants trained over the roof is objectionable, for in general the plants are too much confined, receive too much moisture and heat, grow too luxuriantly, and consequently seldom flower in perfection; besides they require much attention to keep them in order and to free them from insects, and at certain times they produce too much shade.

2. *Atmosphere, Temperature, &c.*

The most obvious defects in the present management of Orchid-houses consist in the want of attention to their atmosphere, particularly as regards moisture, for the plants in such structures derive the greater part of their subsistence from the vapour of the house; much more, therefore, depends upon this point in

the cultivation of these plants than most persons seem to be aware of. When the plants are exposed to every change of temperature and humidity, they are liable to suffer, and this in proportion to their luxuriance. Great attention, therefore, should be paid to the state of the atmosphere, and, as I have already said, to having at command ample means of producing an abundance of heat or moisture, the one to counteract the other, whenever either may be in excess. When an excess of moisture takes place, admit external air freely, raising the temperature at the same time; when dryness prevails, reduce the temperature and increase moisture by evaporation; for the amount of exhalation from the foliage depends upon two circumstances, the saturation of the air and the velocity of its motion when dry. Damp air, or floating moisture of long continuance, would be detrimental to the plants, for it is absolutely necessary to health that the process of transpiration should proceed freely under all circumstances.

In a confined atmosphere like that in which Orchids grow, it might be found beneficial to the health of the plants if a small quantity of ammonia or carbonic acid were set free in the air, or dissolved in the water used in syringing the plants, both these substances being very soluble. The latter might be applied to the air, by placing large pieces of fresh chalk or limestone on the shelves, and pouring sulphuric acid, diluted, over them; shallow pans, filled with oats or barley beginning to vegetate, are also beneficial to plants confined in a warm damp atmosphere.

In managing the temperature of an Orchid-house, some have been misled by fancying, that because the inmates come from what is called a "tropical climate," they should naturally be kept very hot and moist at all times; others again imagine that those from the hotter and damper parts cannot be advantageously cultivated in the same house with those from drier and cooler stations. Now in all places where epiphytal Orchids are found, there are at least two seasons, a dry and a damp, with transitions from each; and although the transitions may be but of short duration, yet they represent spring and autumn. Orchids, therefore, like other plants, have the power of adapting themselves to changes of climate and locality, both as regards heat, shade, moisture, and full exposure to bright light, and they will even endure a certain degree of cold. Lælia majalis grows upon oaks in the mountains of Mexico, where the ground in the cool season is sometimes covered with hoar frost. Such low temperature, however, must always be endured at the expense of vigour. Again, plants, natives of a colder climate, may be grown in a far warmer one than ever they were subjected to in their natural state, provided at all times the extra heat

and moisture are judiciously applied, and only when the plants are in full vigour and in good health; so we find that air plants, although naturally subjected to a high temperature, may, with proper precautions, be grown with advantage in a much lower one; and as all plants grown in a lower temperature than their natural one require less moisture, so Orchids, in a cool atmosphere, should be kept drier during a certain period of the year; an increase of moisture should only be given with an increase of heat, and that only in the growing season. It should be recollected that no plants can exist for any very great length of time without rest, and that rest is induced in a tropical climate by drought, in the same way as low temperature in our own country suspends vital energy: therefore Orchids must be subjected to the usual seasonable changes of rest and activity. Rest is induced by withholding moisture from their roots, and partly from the air, and this state of things may be considered to represent their winter. Spring should be imitated by gradually reviving vital energy by increase of moisture, first to the atmosphere, and afterwards to the roots or soil, accompanied by a proportionate increase of temperature: this period of their growth should be very slow. Summer must be represented by a greater increase of both heat and moisture; partial shade should also be resorted to to bring the energy of the plant into full force. And lastly, an autumn must be created to bring about maturity, by gradually reducing the quantity of both heat and moisture, until the plants are again brought to a fit state for repose. The first and last stages should be of but short duration, and require caution, otherwise much mischief may be done to the plants.

By growing Orchids in the mean instead of maximum of heat and moisture, they will not make such rapid growth; but they will become more robust and healthy, and be less liable to receive injury from sudden transitions, either of heat, drought, or moisture, in the atmosphere.

The temperature of the house can only with certainty be kept regular by night, particularly in summer; therefore the fire should never raise the heat of the principal house higher than 60°, and about five degrees less should be maintained where the plants are in a less excitable state: but as the days lengthen, so the temperature may rise; yet it should if possible never range higher than 75° by night in summer; it will occasionally, however, be higher in very warm weather, and should be counteracted as much as possible by evaporation and ventilation by night, and by both, as well as by shading, by day. Injury is often effected by a sudden rise of temperature by fire heat in winter, while little or none is caused if the rise is occasioned by sun-

heat: care should therefore be taken to guard against a rise of temperature by fire heat, particularly in midwinter; rather suffer a depression of a few degrees of heat in very severe weather than use over-strong fires, which will over dry the atmosphere, and, on the other hand, create too much moisture if water is supplied. Moisture, however, is by no means injurious to Orchids, provided they can part with it freely, but they are impatient of stagnant damp.

When in a dormant state, they should receive no more moisture than is sufficient to prevent their leaves from shrivelling: hence many of the more tender kinds do much better on blocks of wood suspended from the roof, where they can part with the superabundant moisture freely, than in pots. Nature herself indeed sets us an example to follow in regard to moisture, for we find, where the atmosphere is saturated with moisture (and a truly moist atmosphere cannot exist without a corresponding amount of heat), that the Orchids climb the loftiest trees; but as the climate becomes drier, so they descend, until at last they are to be found growing upon the surface of the ground or upon rocks in shady places.

Epiphytal Orchids may be divided into three classes, so far as situation is concerned, viz., those which grow on the bare branches of trees, and that require a very moist and warm atmosphere; those which require a light fibry material to cover their roots, and a cooler and drier atmosphere; and those that like a cool atmosphere, and require a rich vegetable mould, retentive of moisture, to grow in. The first, like the old air plant (Aërides odoratum), have true aërial roots, and are principally from the hot damp parts of the East; the second kinds come from the milder tracts, particularly of the Western hemisphere; while the third are those from an atmosphere cool and dry, and which seek refuge on the ground.

3. *Soil, &c.*

More difference of opinion exists upon this point than upon any other item of their culture, and it is certainly one deserving of attention; for although it may be of little or no importance to an air plant whether it is grown in rich or poor soil, so far as nutriment is concerned, still it is necessary to know whether the soil, or whatever its roots may be surrounded by (some use nothing but broken potsherds in very small pieces), is retentive or not of moisture, and whether it parts freely with the same to the surrounding atmosphere when required. The best material is that which is not retentive of moisture, nor liable to become stagnant, or what is termed sour, and that which, under the in-

fluence of a damp and warm atmosphere, resists decay longest. It will therefore be found, that very fibry peat, obtained fresh from the common, freed from all small particles of peaty matter, is most suitable for the purpose. The latter process may easily be accomplished by beating it when it is dry. The fibre should be left a few days to dry before it is used, and afterwards, when required, it should be mixed with a few half-decayed leaves, which must be quite dry and free from any small pieces of stick that rot and breed fungi in the soil.

When shifting, or fresh potting, be particular to drain well, especially for those grown in pots. If the plant is to be kept in a pot, always place a small inverted pot in the bottom of the other, and fill round the sides and over the inverted pot until the pot is filled with potsherds to within three inches of the rim; then put in a sufficient portion of the roughest fibre to slightly elevate the plant above the rim, and cover up the roots (if they require so doing) with the fibry mixture, pressing it rather firmly round the stems, but in no other part, more particularly near the outside.

In shifting, remove all the old soil from the roots, when such can be done without injury, and in all cases allow the plants to become rather dry for a few days prior to the operation, and for a like time afterwards before moisture is applied; which should be, first to the atmosphere sparingly, and afterwards to the roots or the soil.

No season can be recommended as the proper one for shifting Orchids, but generally it may be done shortly after the plants have commenced forming young or fresh roots, and which in general will be some time after they have flowered, and just before they commence a fresh growth. All the plants should be shifted at least once every two years; but when, and the length of time between the shiftings in some cases, will entirely depend upon circumstances. One thing, however, is certain, that whenever the soil becomes in any way sodden, or when the plant has lost its roots from having become over dry, shifting at once is the best remedy.

Top dressing also is very necessary at times, particularly with very large plants; but if small ones require anything, remove the soil entirely.

With respect to those kinds which require to be grown upon blocks of wood or in baskets, less danger is likely to accrue from a slight excess of moisture, when they are in a growing state, than from a want of it; therefore sphagnum, or rough fibry peat, should be fastened round the blocks, or placed about the roots in the centre of the baskets, in order to retain sufficient moisture when the atmosphere becomes too dry.

The blocks on which the plants are grown should be of those kinds like the apple or pear, with a smooth surface, and in a fresh state when the plants are fastened upon them. The fastenings should be effected by copper wire and nails; old dry blocks, with rough bark, or charred ones, are bad, on account of their easily becoming too dry, particularly the charred ones, whose black surface absorbs heat, which is injurious to the young roots, especially in summer.

Native plants, which frequently spring up about the roots of Orchids, on blocks or in baskets, are useful indexes to the state of the soil as regards moisture in summer, for they soon flag with lack of moisture.

Blocks or baskets are perhaps, in the majority of cases, best for true Epiphytal Orchids, but on these they require more attention, in regard to moisture, than when grown in pots. In the case of Stanhopeas, however, it is absolutely requisite to grow them upon blocks, as their flowers grow downwards. Again with Aërides, and all true air plants having thick fleshy aërial roots, it is necessary to place them upon blocks or in baskets, and to suspend them from the roof, so that their roots may grow freely in the damp atmosphere, for if confined under the soil they soon perish. Fibry peat, moss, or sphagnum, when used for the purpose of covering the roots, is of no other use than that of retaining moisture. Sphagnum and moss of all kinds is bad, if not fully exposed to the atmosphere, and soon becomes mouldy: it should only be used on blocks or on the outsides of the baskets.

In suspending the blocks, always place them perpendicularly, and the baskets quite horizontally; and invariably have them taken down and examined every third day in summer, and once a week in winter, to see if they want watering. This must be done independently of syringing, for some parts of the blocks may be found to be quite moist enough, while other parts are dry. Some Orchids are the better for being placed near the glass when in a state of rest, and for being fully exposed to the light for a short time, particularly such plants as Barkerias, Stanhopeas, and other deciduous or subdeciduous kinds; it is a mistake to suppose that all Orchids should be rested during winter—each should be rested when it naturally requires it, whether it be winter or summer; some kinds bloom during the winter months, and consequently require rest at another season. Lælias are of this kind.

The soil of plants in pots, when placed upon the smooth surface of slate shelves, is apt to become too moist during winter, owing to the water not being able to pass off freely through the hole in the bottom of the pots, or from their absorbing

moisture from the shelves: this evil is, however, easily obviated by placing small square pieces of lathwood under the pots, which allows the superfluous moisture to pass off freely.

Watering, or the supplying moisture to the plants, should be done with much caution, particularly with respect to the kinds which have large leathery permanent leaves and less succulent stems, like Cattleyas, &c.; for in many cases, when given over head, the water collects upon the leaves and afterwards runs down into the hearts of the young shoots and rots them. Heavy syringing, or watering over head, except in very dry weather, even though with care, is objectionable, more particularly in autumn.

When the plants are large, Orchids are easily increased by dividing them into pieces, each having a portion of the root attached to it, and a young bud at the base of the pseudo-bulb. This should be done when the plants have just commenced growing. The hard dry woody stems of Cattleyas, Lælias, and similar sorts, should be partly cut through with a sharp knife some time previous to removal; old pseudo-bulbs seldom grow when separated, therefore always choose a young bulb, and one from the outside of the plant, having a fresh bud at its base.

4. *Treatment of fresh imported plants, &c.*

Orchids, when newly imported from their native country, or which have become sickly from improper treatment or other causes, require the same kind of management to bring them into health. The best way to effect this is to lay them on some dry moss, and place them in a shady part of the stove, or in some close pit where there is but little moisture in the atmosphere, and where they can remain until they show signs of growth. The atmosphere surrounding them, and the moss, should be gradually moistened, first their leaves, and stems afterwards, for nothing is more fatal to fresh imported plants than much moisture; but when they begin to emit new roots, treat them in the same way as plants recovering from a state of rest. Most Orchids perfect their foliage first, and flowers afterwards, whether on annual or deciduous stems, or otherwise; and when any plant blooms profusely it seldom recovers its vigour again before the second season, more especially if its blooming has been prolonged much beyond the usual time. Removing the plants when in bloom to a cool dry place, and keeping them for a long time in bloom, is injurious, particularly if they have previously been subjected to a high temperature and much moisture; such treatment should therefore be avoided as much as possible.

5. *Insects.*

In building an Orchid-house it is very desirable to have no crevices or apertures left in any part of the walls, or round the pipes, in which insects can harbour; if such is the case little hopes can be entertained of effectually ridding the house of such pests as the cockroach, or even of keeping them sufficiently under.

The cockroach, which is the greatest enemy to Orchids, only feeds by night, or in the dark; he frequently finds his way into the interior of the pots amongst the broken crocks, and eats all the young roots unseen. These pests delight in the hottest parts of the house, either in a moist or dry heat; their food is chiefly the tender points of the young roots and flower buds, and it is amazing the mischief a single insect will do in one night, for if the points of the young roots are once eaten off, the root is rendered of no service to the plant until it again forms a fresh point.

The cockroach, however, is by no means nice as to his food, for he sometimes has no objection to eat his dead companion; he will also eat any kind of fat or greasy matter, and this is sometimes mixed with arsenic for his destruction, but with little success, for he certainly prefers the tender points of the roots to such food. Some employ toads and frogs to catch them, but these are slow, and the cockroach is very nimble: they therefore seldom come into contact. I have found from experience that the only way to destroy, or at least to keep such pests from doing any great damage, is to constantly look after them every evening after dark, and particularly in the winter time, and kill them; this may easily be done if there are no crevices in the walls or round the pipes for them to escape into.

The woodlouse is another pest to Orchids: he may easily be trapped in the usual way in the dark and damp corners, or he may be fed with slices of potato placed upon the surface of the pots. As these insects feed in the daytime as well as at night, they are easily destroyed.

Our next pest is the small brown ants, which, if not kept under, in time, become so numerous as sometimes to entirely destroy the plants. They are day enemies, however, and are easily destroyed by arsenic in the following way: pound some loaf sugar very fine, and mix with it a small portion of arsenic; then grind the mixture on a smooth piece of slate with the face of a hammer into an impalpable powder, so that the little creatures cannot separate the sugar from the arsenic; then take some small pieces of white card paper, put as much upon each as would lie upon a shilling, and place it near where the ants frequent. The dose

must be repeated whenever any again appear, as the pupæ left behind are hatched after the old ones are destroyed.

The slug, or small snail, which is also destructive to Orchids, may be trapped with lettuce leaves placed amongst the pots; it feeds after dark, and should be sought for in the evening by candle light.

The red spider, thrips, and different kinds of scale, may all be destroyed by syringing the leaves, first with warm water, and afterwards with a weak solution of tobacco-water and sulphur. With attention, therefore, all these pests may be kept under: persevere constantly until you have entirely exterminated them, and afterwards make all fresh received plants do quarantine before they are admitted into the house.

Fumigation is requisite in summer and autumn; for the small black or green fly sometimes makes its appearance upon the flower stems. Blowing tobacco-smoke with the bellows into the crevices and holes in the wall will also be found the best means of driving the cockroach from his hiding place in the daytime.

Washing the leaves with a sponge and warm water (not hot) regularly every ten days, will prevent the increase of all such pests as the scale, red spider, thrips, &c., and it will at the same time greatly tend to keep the plants in health and vigour.

6. *Selection of fifty kinds.*

To make a selection of Orchids to suit everybody's taste would be a difficult task, more especially from so extensive a family, in which, from the worthless weed to the perfection of floral beauty, there is every variety of form and colour. Besides, some of the least attractive to look at are the most fragrant; while again some of the largest and most gaudy flowered kinds are so transient as only to last for a few hours in a perfect state.

In the following list I have selected the most showy genera only, and in those the most free growing kinds, having an eye to preserving as much variation as possible both in appearance and time of flowering. The latter, however, like that of most other plants, may be varied by encouraging them to make early and rapid growth, and on this account they will be sooner in a fit state to receive rest; they may consequently be made to bloom earlier next season, and if once got into an early state they will retain the same under a regular system of treatment afterwards, while, on the other hand, their season of flowering may be retarded by keeping them a little longer than their usual time in a state of repose. Their seasons of flowering under different kinds of treatment may therefore be varied very much, although

in their natural state they mark with the greatest regularity the returning seasons, regardless of the state of the weather.

In the following list I have omitted some very beautiful kinds, such as Miltonia Karwinskii, Vanda Batemanni, Vanda Lowei, and others, on account of their great rarity; also others on account of the difficulty experienced in cultivating them; of this latter class is Epidendrum bicornutum. In conclusion I would observe that all directions are vain unless they are rigidly attended to. The great art in cultivating aërial plants consists in guarding against all extremes, whether of heat, moisture, dryness, or low temperature: for although one kind naturally may stand cold and another heat, and a third drought, and a fourth moisture in extremes, still these are bad precedents, and he who wishes to excel in Orchid culture will always choose the happy medium.

1. *Phalænopsis amabilis.*—This Queen of Orchids comes from Manilla, and produces its large round pure white flowers in compound spikes nearly all the year round in succession. It is best grown upon a bare block with a smooth surface, and fully exposed to the light, in rather a warm and damp part of the house, but where there is no stagnant moisture.

2. *Odontoglossum grande* comes from Guatemala, and produces its very large flowers in an upright spike in September and October. The flowers are mottled and striped with brown and yellow like the back of a tiger; the lip is white, edged with light purple. It is best grown in a well-drained pot or on a rugged block surrounded with the fibre of fresh peat and half-decayed leaves. It is impatient of stagnant moisture at all times, and should be grown in a fully exposed cool part of the house like the former. Its flowers remain long in perfection, but are scentless.

3. *Cattleya Skinneri*, a lovely Guatemala plant, produces its large rosy-purple flowers in heads of six or eight together in February and March. It is best grown in a pot in fibry peat with a few half-decayed leaves, and should be placed at the warmest end of the house; it wants little shade or moisture except in the growing season. The flowers remain two or three weeks in perfection, but are without scent. It is the "Flor de San Sebastian" of the Guatemalese.

4. *Cattleya Mossiæ*, a magnificent plant, of which there are many varieties, has the largest flowers of all the Cattleyas. Its flowering time is from May to August, the blossoms being of

every shade of colour, from pale pink to deep rosy purple, and veined with yellow in the centre, according to the variety. They remain about ten days in perfection, if kept free from moisture, and are fragrant. It requires the same kind of treatment as the preceding; it comes from La Guayra. Stagnant moisture is very injurious to the young shoots.

5. *Cattleya crispa*, which has two or three varieties, flowers in July and August. The flowers are pure white, with a purple lip beautifully curled at the edge; they remain in perfection about ten days, if kept in rather a dry atmosphere. It requires the same kind of treatment as the two preceding, and is from Brazil.

6. *Oncidium Lanceanum* flowers in June, July, and August. The flowers, very showy, are bright yellow, blotched with crimson; the lip rich violet. It should either be placed in a rustic basket or on a rugged block of wood, and should be surrounded by fibry peat, and suspended from the roof of the house, where it can have plenty of light, heat, and moisture during the growing season. It is from Surinam; fragrant and durable.

7. *Oncidium sphacelatum majus* is a neat free-flowering variety, with rather small but numerous yellow flowers, banded with dark brown. It flowers in May and June, and is best grown in a pot in fibry peat, with plenty of drainage, and at the coldest end of the house. It is from Honduras; it remains long in perfection, but is scentless.

8. *Oncidium guttatum* flowers in May and June, and sometimes later; there are some varieties of it. The flowers, very showy, are thickly placed on dense branched spikes, yellowish green spotted with dark brown, the lip being still darker and self-coloured. It is best grown in a pot in the coolest part of the house; it is from Jamaica, and remains long in perfection.

9. *Miltonia spectabilis.*—This fine Brazilian plant produces its large flat solitary flowers in August and September; they are yellowish white, the lip rich purple and yellow; there is a variety of it which is all purple. It is best grown in a pot in fibry peat, with plenty of heat and light, and but little moisture except in the growing season. Its flowers remain nearly a month in perfection.

10. *Miltonia candida, var. grandiflora*, produces its showy flowers in simple spikes, the flowers being of a deep rich brown,

spotted at the extremities with yellow; the lip is white. The variety is double the size of that belonging to the original species. Like the preceding, it comes from Brazil, and requires the same kind of treatment. It remains nearly a month in perfection.

11. *Lycaste Skinneri*, a very showy Guatemala plant, which produces its large solitary flowers from November to April. In colour the blossoms vary from pale flesh to rosy purple, the centre being deep crimson. It is best grown in a pot filled with the fibre out of peat, mixed with a few half-decayed leaves. It should be placed in a cool part of the house, where there is plenty of light, but little moisture except during the growing season; its flowers are scentless, but remain nearly a month in perfection.

12. *Lycaste cruenta* is also a desirable species, which flo ers in February and March, and is from the same country as the last. The flowers are produced singly, and are deep yellow or orange, with a dark crimson mark in the centre. Like the preceding, it succeeds best in a pot, and in the same kind of material; it should be kept in the coolest part of the house, where it has plenty of light, and little heat and moisture, except during the growing season, when it should have a liberal supply. Its flowers remain long in perfection, and are very fragrant.

13. *Barkeria spectabilis*, an elegant little plant from Guatemala, which flowers in June and July. The blossoms are produced in short spikes, and are rosy pink or blush, dotted with deep crimson. It succeeds best on a bare block of wood suspended near the glass, where it can enjoy plenty of light and little heat or moisture, except in the growing season. Its flowers (scentless) remain long in perfection.

14. *Saccolabium guttatum*, one of the most beautiful of Orchids, from the hotter parts of India; it flowers at different times from May to August, the flowers being in very close dense spikes, white and beautifully spotted with deep rosy purple. The lip is purple. It does best on a block, or in a basket, with its roots fully exposed, and suspended near the roof, where there is plenty of heat, light, and moisture, particularly during the growing season. This plant requires very little repose; it remains long in bloom.

15. *Lælia superbiens*.—A magnificent Orchid from Guatemala, which remains in flower from November to January; the flowers are produced in clusters of from eight to sixteen, on stiff

stems from five to seven feet in length; the blossoms are large and bright rosy purple. It succeeds best fastened on a large rugged block hung up in a cool airy part of the house, where it can have plenty of light and little moisture. The flowers remain a long time in perfection. [A specimen in the Garden of the Society has had seven such spikes open at the same time—a spectacle of unrivalled beauty.]

16. *Lælia Perrinii.*—An elegant plant from Brazil, which flowers in October and November; the blossoms, three or four together, are produced on short stems, and are light purple with a crimson lip. It is best grown in a pot, in fibry peat and half-decayed leaves, in a cool part of the house, where there is but little moisture, except in the growing season, at which time it requires a liberal supply of both that and heat. The flowers remain a considerable time in perfection, and are somewhat fragrant.

17. *Lælia anceps.*—A beautiful Mexican species, which flowers in November and December; the blooms are produced, two or three together, at the end of a slender stem, two or three feet in length; they are large, rosy lilac, with the lip veined with crimson and yellow. It succeeds best on a rugged block, surrounded with fibry peat and suspended in a cool, airy, light part of the house. Its flowers remain long in perfection; they are but slightly fragrant.

18. *Cœlogyne cristata.*—A native of the Khoosea hills of India; it flowers in April and May; the blossoms, somewhat large, are white and yellow, stained in some parts with pink. It is best grown upon a block, surrounded with fibry peat and half-decayed leaves, and placed in a cool, airy part of the house. Its flowers remain long in perfection, and are very fragrant.

19. *Cœlogyne Wallichiana.*—A charming little Orchid from the same locality as the last; it flowers in September and October, and is one of the dwarfest, not being more than two or three inches in height; nevertheless, it has very large solitary, deep rose-coloured flowers. It succeeds best on a block, surrounded with fibry peat and half-decayed leaves, and placed in a cool, airy part of the house, near the light; it requires much attention, the pseudo-bulbs being so very small, to keep it in good growing condition. The flowers remain long in perfection; they are not very fragrant.

20. *Brassia macrostachya* comes from Demerara, and pro-

duces its very showy flowers, generally twice a year, in spring and in autumn; the blossoms grow in long spikes, and are of a yellowish green colour, dotted all over with dark brown. It is best grown in a pot in fibry peat and half-decayed leaves, and placed in a dry, warm part of the house. The flowers (scentless) remain long in perfection.

21. *Vanda teres.*—This beautiful Vanda comes from the hotter parts of India, and flowers from June to August; the flowers are tolerably large, variously coloured with red, yellow, and white. It does best fastened to a long, rugged branch, surrounded with very fibry peat, and suspended in the hottest and dampest part of the house during the growing season; afterwards it should be kept less moist, but equally warm, as it needs but little repose. The flowers remain long in perfection, and are very fragrant.

22. *Scuticaria* (Maxillaria) *Steelii.*—A Demerara plant, which produces large solitary flowers from June to September; they are dull reddish yellow, blotched or marbled with deep purple. It delights in a block, surrounded with very fibry peat, and should be suspended from the roof, where there is plenty of heat and moisture, during the growing season. Its flowers are very fragrant.

23. *Stanhopea tigrina.*--This extraordinary looking thing and its varieties come from Guatemala and Mexico; it flowers from June to August; the blossoms are pendulous, very large, pale yellow, banded and blotched all over with dull, purplish brown, which is more intense in some varieties than in others. It succeeds best on a forked block in fibry peat and half-decayed leaves, and it should be suspended from the roof in the coolest and driest part of the house; in the growing season, however, it should have a liberal supply of moisture and plenty of heat. Its flowers only remain in perfection two or three days; they smell strongly.

24. *Stanhopea grandiflora* is a Demerara species, and flowers in July and August; the blossoms are white, very large and pendulous. Like the preceding, it should be grown on a block and in a similar situation. Its flowers remain but two or three days in perfection; it is very fragrant.

25. *Renanthera coccinea.*—A handsome Chinese Orchid, which flowers in June and July, and even later; the flowers, orange scarlet, are produced in large panicles. It does best

fastened to a long, rugged branch, surrounded with fibry peat and sphagnum or common moss. It requires to be kept in the hottest part of the house, and where there is but little moisture, except in the growing season, when it demands abundance to feed its large aërial roots. Its flowers remain long in perfection.

26. *Phajus Wallichii.*—A fine showy plant from India, which flowers from February to May; the blossoms are produced in upright spikes, two or three feet in length, rather large and of an orange yellow, or buff, tinged with purple. It does best grown in a pot, filled with light, fibry peat, leaf-mould, and a little well-decomposed cowdung, and requires, when in a growing state, a very strong heat and abundance of moisture; afterwards, however, when in a state of rest, it should be kept nearly dry and very cool. Its scentless flowers remain long in perfection when in a dry atmosphere.

27. *Dendrobium Wallichianum.*—This very beautiful Dendrobe is the Indian form of the Chinese D. nobile; it has, however, finer and darker flowers; the latter are produced in great abundance from March to June on leafless stems of the preceding season's growth; they are rosy purple, the lip margined with dark crimson. It does best in a pot amongst fibry peat and leaf-mould; it likes plenty of heat and moisture during the growing season, but afterwards a comparatively cool and dry situation suits it best. Its flowers remain long in perfection, double the time of those of D. nobile.

28. *Dendrobium formosum.*—A showy Indian species, whose flowers are produced in clusters at the end of the shoots, which are about a foot in length, either in autumn or spring; the flowers are large, pure white, with a bright yellow centre. It succeeds best in a well-drained pot or basket, filled with fibry peat and half-decayed leaves, and likes plenty of moisture and heat during the growing season; afterwards it should be kept very cool and nearly dry. Its flowers, which are scentless, remain long in perfection when properly treated.

29. *Dendrobium pulchellum* comes from the mountains of Sylhet in India; it flowers in April and May; the blossoms are rather large, numerous, and variously marked with yellow, greenish white, bright rose and orange red. It is best grown on a block, or in a basket, surrounded by fibry peat and half-decayed leaves: when not growing, keep it cool and rather dry. Its flowers remain long in perfection.

30. *Dendrobium chrysanthum.*—A fine Indian species, which flowers in February, March, and April; the colour deep yellow, with a dark red lip. It may either be grown in a basket suspended from the roof, or in a well-drained pot filled with fibry peat and half-decayed leaves, with plenty of heat and moisture during the growing season; afterwards it should be kept nearly dry and very cool. Its flowers only remain a short time in perfection.

31. *Dendrobium Dalhousieanum.*—This charming species comes from India, and flowers in March and April; the blossoms are very large, seven or eight together in a bunch, pale lemon, with a pink margin, and two dark, blood-coloured spots in the centre. It succeeds best in a well-drained pot, filled with fibry peat and half-decayed leaves; it likes plenty of heat and moisture when in a growing state. Its flowers only remain a short time in perfection; it resembles D. cupreum.

32. *Dendrobium cucullatum.*—A pretty plant, which, like the preceding, comes from India; it flowers profusely in March and April on the leafless stems of the preceding season; the blossoms are light rose and pale lemon. It does best in fibry peat in a basket suspended from the roof, and, when in a growing state, requires less heat and moisture than any of the preceding kinds; but afterwards it should be kept rather dry and cool. Its flowers, which are scentless, remain long in perfection.

33. *Coryanthes macrantha.*—This extraordinary plant comes from the Caraccas; it flowers in June, the blossoms being extremely large, two or three together, on a pendulous scape; the lip is blood-red, the rest orange yellow, spotted irregularly with dull purple. It succeeds best on a block, surrounded by fibry peat, and suspended from the roof; it likes plenty of light, and little moisture, and should be kept rather warm, except in the growing season, when a pretty liberal supply of moisture and strong heat should be given; overmuch moisture at any other time is fatal to the plant. Its enormous flowers only remain in perfection two or three days; they emit a rather strong odour; this is the most singular of all Orchids.

34. *Sobralia macrantha* comes from Guatemala, and flowers in July and August; the flowers, rosy purple and crimson, are very large, and are produced one after another in succession from the tops of the long reed-like stems. It does best in a large pot in fibry peat, leaf-mould, and a small portion of well-decomposed cow-dung; it likes bright light, and but a moderate amount of

heat and moisture during the growing season; afterwards it should be kept very cool, but never very dry at any time. Its flowers are scentless, and only remain two or three days in perfection.

35. *Chysis bractescens.*—This useful plant comes from Oaxaca; it flowers in March and July; the blossoms, which are large, and pure white with a yellow centre, are produced in a cluster of five or six together. It succeeds best on a rugged block, or in a basket surrounded with fibry peat, and suspended near the roof, where it should have a plentiful supply of moisture and heat during the growing season; but afterwards it may be kept cool and nearly dry, for it is very impatient of much moisture. Its flowers remain long in perfection, and have a slight odour. [Of all plants this is the best adapted for decorating ladies' hair. Its flowers may be used once, twice, thrice, or even four times, if skill be applied to their preservation, and yet they are fresh and sweet.]

36. *Zygopetalum Mackayi.*—A desirable Brazilian plant, which flowers in November, December, and January; the flowers are produced in upright spikes, large, greenish yellow, spotted or striped with brown and lilac. It is best grown in a well-drained pot, filled with fibry peat and half-decayed leaves; when at rest, it should be kept rather dry and cool. Its flowers remain long in perfection, and are very fragrant.

37. *Ansellia africana* comes from the island of Fernando Po, and flowers in February, March, and April. The flowers are produced in upright panicles; they are pale green, spotted and banded with crimson, and have a pale yellow lip. It succeeds best in a large pot, well drained and filled with fibry peat and leaf-mould, with plenty of heat and moisture during its growing season, but afterwards it may be kept rather cool, but never very dry. Its flowers remain long in perfection, and emit a slight odour.

38. *Acineta Humboldtii.*—This singular plant comes from La Guayra, and flowers in April, May, and June; the flowers are of a chocolate colour, marbled with light brown, large, and produced in long, pendulous bunches. It is best grown on a rugged block, surrounded with fibry peat and half-decayed leaves, and suspended near the roof, where it can receive a liberal supply of heat and moisture during the growing season; afterwards, but only for a short time, it should be induced to rest by keeping it rather dry. Its flowers remain only a short time in perfection; they are fragrant.

39. *Aërides odoratum.*—A charming plant from India, which flowers in May, June, and July; the blossoms, borne in racemes, are white, stained with pink. It is best grown upon a rugged block, or in a basket suspended from the roof of the house, its true aërial roots being freely exposed; it likes plenty of heat and moisture, especially during the growing season. Its flowers remain long in perfection, and are deliciously fragrant.

40. *Aërides crispum* is also a fine Indian species, which flowers in July and August; the blossoms, white and tipped with pink, are produced in panicles. It succeeds best on a block or in a basket, in fibry peat, suspended from the roof; it should have plenty of heat and moisture during the growing season, and only a short season of rest afterwards. Its flowers remain long in perfection, and are very fragrant.

41. *Cymbidium Mastersii.*—This showy plant comes from India, and flowers from August to September; the flowers are large, pure white, with a yellow centre. It does best in a well-drained pot, in fibry peat and leaf-mould, and in a rather low temperature, with but little moisture in the atmosphere even in the growing season; it should be kept in the coolest part of the house at all times. Its flowers remain long in perfection, and are slightly fragrant.

42. *Peristeria elata.*—A noble Orchid, familiarly known as the "Holy Ghost plant," comes from Panamá, and flowers in August and September; the white flowers are produced on upright stems three or four feet high. It does best in a large pot, well drained, and filled with fibry peat and leaf-mould; it should be placed where there is plenty of light, heat, and moisture. Its flowers remain long in perfection, and are very fragrant.

43. *Mormodes luxatum.*—This tall Mexican plant produces its large, pale lemon-coloured flowers, six or eight in a spike, during autumn. It is best grown in a pot filled with fibry peat and leaf-mould, and should be kept in the coolest part of the house, and where there is only a moderate supply of moisture even during the growing season. Its flowers remain long in perfection, and emit a powerful aromatic odour.

44. *Leptotes bicolor.*—A neat Brazilian Orchid, which grows only two or three inches in height; it flowers from March to May, the blossoms being numerous, and distinctly two-coloured, the upper portion pure white, the lower bright purple. It does

best fastened to a small rugged block, surrounded by fibry peat, and suspended from the roof; it should have plenty of light, and a moderate share of heat and moisture nearly all the year, as it requires but little rest. Its flowers, scentless, or nearly so, remain long in perfection.

45. *Cycnoches Loddigesii* comes from Surinam, and flowers in June, July, and August; the blossoms are large, greenish yellow, with a white lip, and are produced in suberect spikes. It is best grown in a well-drained pot, filled with a mixture of fibry peat and decayed leaves, and placed in a warm part of the house, but where there is only a moderate supply of moisture, even in the growing season, as the plant is easily injured by damp. Its flowers remain long in perfection, and have but little scent.

46. *Epidendrum macrochilum roseum.*—This fine dwarf plant is called in Guatemala "Bosca del dragon," or dragon's mouth; it flowers in April, May, and June; the blossoms are large, four or five together, dull crimson, rosy lilac and white. It is best grown in a well-drained pot, filled with fibry peat and half-decayed leaves, and placed in a warm and rather moist part of the house during the growing season; but afterwards it should be kept very cool and rather dry for a short time. Its flowers remain long in perfection, and are very sweet scented.

47. *Epidendrum Stamfordianum* comes from Guatemala, and flowers in April and May; the blossoms are somewhat small, but are produced in great abundance on large panicles; they are of a greenish yellow, thickly spotted with brownish purple. It succeeds best in a well-drained pot, filled with fibry peat and decayed leaves, and in rather a warm and moist situation during the growing season; afterwards it should be kept cool, but not very dry. The flowers remain long in perfection, and are remarkably fragrant.

48. *Sophronitis grandiflora.*—This elegant little Brazilian plant flowers in April and May; the flowers are produced singly, are orange red, and large for the size of the plant. It does best fastened to a block on fibry peat, suspended from the roof; it likes plenty of heat and moisture during the growing season, but afterwards it should be kept rather cool and dry. Its flowers, scentless, remain long in perfection.

49. *Trichopilia tortilis* is a native of Mexico, and flowers at different times during the year; the flowers are solitary and

large, with twisted sepals and petals, of a yellowish white, spotted or marbled with dull blush; the lip is nearly white, and very large. The plant may be grown either upon a rugged block, surrounded with fibry peat, or in a well-drained pot filled with fibry peat and half-decayed leaves; it only requires a very moderate amount of heat and moisture during the growing season, and should be kept quite cool and rather dry afterwards for a short time. Its flowers remain long in perfection, but have no scent.

50. *Odontoglossum citrosmum.*—This very beautiful Mexican plant flowers in June and July; the blossoms are large, seven or eight together on a slender stem, white stained, with rosy crimson near the margin. It does best fastened to a rugged block on some rough fibry peat, and suspended from the roof; it requires a warm situation, but not one that is over moist even in the growing season, as stagnant moisture is very injurious tô this plant. Its waxy large round flowers, somewhat resembling those of Phalænopsis amabilis, remain long in perfection, and are delightfully lemon-scented.

IV.—*Contributions to a History of the Relation between Climate and Vegetation in various parts of the Globe.*

No. 9.—*The Vegetation of Ceylon.* By George Gardner, F.L.S., Director of the Royal Botanic Gardens, Ceylon.

Although Ceylon is celebrated for the luxuriant vegetation by which it is covered, the plants which compose it are less known to botanists than those perhaps of any other portion of India of equal extent. While the history and uses of the vegetable productions of the possessions of the East India Company, and most of the islands of the Indian Archipelago, have been given to the world by modern botanists, those of Ceylon are at the present day nearly as little understood in Europe as they were 100 years ago, when Linnæus published his 'Flora Zeylanica,' founded on collections which had been made in the island by Hermann, a Dutch botanist, about seventy years before. It is true that during the last few years the descriptions of several Ceylon plants have been published in different scientific periodical publications, both by Indian and European botanists; but although a botanical institution has been maintained in the colony at the expense of Government for upwards of the last thirty years,

those who have superintended it have done nothing almost, either for their own credit or the honour of the establishment. Since the publication of the little book of Linnæus, the only work which has been produced on Ceylon Botany is the 'Catalogue of Plants growing in Ceylon,' published in 1824, by Mr. Moon, who was then Superintendent of the Botanical Gardens—a work which never was of much use, and which is now quite obsolete, as, being merely a catalogue, there are no characters by which to recognize the species he has enumerated. As connected with these observations, I may remark that I am at present engaged in preparing a work which will contain descriptions of all the vegetable productions indigenous to Ceylon, at least so far as I can obtain them, illustrated with coloured figures of some of the more rare, beautiful, or useful species. This, however, will be a labour of several years to come, as I have still to explore different parts of the island, the productions of which are totally unknown.

The vegetation of all countries has its general character determined by two great principal causes—physical aspect and climate. The former having already been detailed in the preceding geological sketch of the island, I shall here offer a few remarks on the latter. The two monsoons which occupy the greater part of the year materially influence the climate. That from the south-west lasts generally from April to September, while the north-east prevails from November to February, the intervening periods being subject to variable winds and calms. The western side of the island, which is exposed to the south-west monsoon, has a humid and temperate climate similar to that of the Malabar coast, while the eastern, which is open to the north-east monsoon, has a hot and dry climate similar to that of the Coromandel coast. The seasons and climates of the south-west and north-east portions of the island are therefore very different. While on one side of the island the rains are falling in torrents, the other is suffering from drought; and it not unfrequently happens that the opposite sides of a single mountain exhibit at the same time these opposite states of climate.

The great variety of surface and of climate, then, which the island possesses, are favourable not only to a varied, but to a luxuriant vegetation, especially in its central and southern districts. From the study of plants taken in connection with these circumstances and their various other physical conditions, has originated the science of Botanical Geography, one of the most interesting branches of Botany, and one which some day will no doubt throw much light on the laws which have regulated the production and dispersion of species. It is only of late years that attention has been given to this subject, for, till the natural

productions of different parts of the surface of the globe came to be investigated with the attention and accuracy which are peculiar to the present age, naturalists rested satisfied with the vague idea that all animals and vegetables had originally radiated from a common centre, and that in the same parallels of latitude the same species would be found. This we now know not to be the case, and it can be as safely asserted that every large tract of country has had its own peculiar creation of both plants and animals, as that two and two make four, the exceptions to this general rule being accounted for by disseminating causes now in operation. In no other way can we account for Europe having a totally different class of plants from that part of North America which lies immediately opposite to it; or for the botany of Southern Africa having little or no resemblance to that of the same parallels in South America, or to that of Australia; or for many small islands, such as that of St. Helena, possessing a vegetation totally different even from that of the nearest continent. Islands, however, in general, approach nearest in the nature of their productions to that of the countries to which they most nearly range in a geographical point of view, and this we shall find to be the case with Ceylon.

Both the climate and the soil of the maritime parts of the western side of Ceylon being very similar to that of the Malabar coast, we find that a large proportion of the plants of both places are identical; and the same holds good with reference to the northern and north-east coasts of Ceylon and that of the opposite Coromandel coast, although each district in both countries is found to possess species which are peculiar to each. A vegetation more or less similar to that of the coast, extends inland to the foot of the great mountain chain; but from thence upwards a very great change is found to take place in it, and almost every 1000 feet of elevation shows a vegetation which, though merging into those immediately above and beneath it, offers species which do not range beyond it. It is at an elevation of from 2000 to 8000 feet that the greater part of the species of plants peculiar to Ceylon are to be found; but most of these belong to forms, that is to natural orders or genera, which form part of the vegetation of neighbouring countries, such as the Neelgherry mountains in the peninsula of India, the Himalaya mountains, the high lands of Malacca, and of the Eastern islands, but more particularly Java, and I have lately met with a few species which indicate an affinity with the continent of Africa.

I shall now offer a few remarks on the nature of the vegetation which characterises the different botanical regions of the island. The truly littoral plants of all countries offer a greater number of identical species in widely separate localities of the same

parallels than those of any other, and this, indeed, was to be expected from the fact that the ocean forms a ready medium for their transmission from one country to another by means of tides, winds, and currents, while at the same time their seeds, unlike those of most other plants, are not injured by immersion in salt water. Most of the shrubs which inhabit the muddy shores of the sea and of the salt lagoons which are so numerous towards the north of the island, and which are known by the name of Mangroves, belong to that natural order of plants which botanists call Rhizophoreæ, a tribe which is strictly intertropical. My researches have already yielded me about half a dozen species, all of which, I find, are common to Ceylon, the shores of the continent of India, and of those of the Eastern islands; and the same I find to be the case with a few other shrubs belonging to other tribes, such as Ægiceras fragrans, which extends even to the shores of Australia, Epithinia Malayana, Pemphis acidula, Dilivaria ilicifolia, Lumnitzera racemosa, Thespesia populnea (the Tulip-tree of Ceylon), and Paritium tiliaceum, the last having a far more extensive geographical range than any of the others, as I possess specimens in my herbarium from the shores of the West Indies, Brazil, and the Sandwich Islands, besides from various parts of India. The Cocoa-nut tree, which gives so marked a feature to the west coast of Ceylon, and which is now so generally cultivated along the shores of all intertropical countries, is essentially a seaside plant, and has as good claims to be considered indigenous to Ceylon as to any other part of the world. The same observations that apply to the shrubs of our shores, apply also to the herbaceous vegetation.

The great flat tract which extends between the sea-shore and the central mountain range is possessed of a very extensive Flora; but as its general character is stamped by a few species which are very numerous in individuals, it is to them chiefly that my remarks will extend. In this tract a very great proportion of the species are identical with those of similar ones on the coasts of Coromandel and Malabar. The generally acid nature of its soil, together with its much drier climate than that of the interior, is well shown in the Northern Province, especially by the more wiry and stunted nature of the trees and bushes, their prickly stems and branches, and the smaller size of their leaves, together with a much greater proportion of fleshy shrubs, such as Euphorbias, &c. The species which preponderate in individuals in the northern province, are different kinds of Acacia, mostly very thorny; the Wood Apple (Feronia elephantum), Limonia alata, Salvadora persica (the true Mustard-tree of Scripture, a tree which extends northward and westward to the Holy Land, and which I was the first to point out as a native of

Ceylon), Carissa spinarum, Gmelina asiatica, Pleurostylia Wightii, Eugenia bracteata, Elæodendron Roxburghii, Ochna squarrosa, Cassia Fistula, Cassia Roxburghii, and Memecylon tinctorium. These are chiefly shrubs and small trees. The large trees, which are mostly of no great size, are two or three species of Terminalia, Bassia longifolia, the Margosa (Azadirachta indica), the Satin wood (Chloroxylon Swietenia), the Ceylon Oak (Schleichera trijuga), the Tamarind (Tamarindus Indica), and the Palmyra (Borassus flabelliformis), which is particularly abundant on the peninsula of Jaffna.* The mass of the herbaceous vegetation belongs to the natural orders Scrophularineæ, Leguminosæ, Rubiaceæ, and Compositæ.

Proceeding southwards through this flat country, a considerable difference in the general appearance of the vegetation is observed, arising no doubt from the greater amount of rain which falls during the course of the year. The trees are not only larger, but their foliage is heavier and of a darker hue; and the numerous Acacias, which give so striking an appearance to the north, almost disappear. Between Colombo and Galle, shrubs belonging to the natural order Euphorbiaceæ are very numerous, both in species and individuals, as well as a variety of Rubiaceæ, of which the beautiful Ixora coccinea is not the least common. It is only in this range that the Pitcher-plant (Nepenthes distillatoria), which is not, however, peculiar to Ceylon, is met with, growing in moist places, and supporting itself among the bushes. About Galle, and from thence inland to the base of Adam's Peak, one of the most common shrubs is that which has been named, in honour of the great Humboldt, Humboldtia laurifolia; and on the low hills, near Galle, a few trees are met with, which, farther north, do not exist under 1000 feet of elevation, but this is easily accounted for by the greater atmospheric moisture of that district. One of these trees is a new and remarkable species of Durian (Durio zeylanicus, Mihi). It is in this district that the greater number of the Sugar plantations of Ceylon exist.

The east side of the island being much drier than that of the west, the consequence is that its vegetation has more of the character of that of the northern province than of the opposite coast. It must, however, be remarked that, with the exception

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* Since the above was written I have made a most important addition to the trees of this region, and, indeed, to the Flora of the island, in the shape of the far-famed Upas-tree of Java and the Moluccas (Antiaris toxicaria), having discovered some fine large trees of it a few miles to the eastward of Kornegalle, early in August of the present year (1847). This discovery proves how little the investigation of the vegetable productions of Ceylon has hitherto been attended to.—G. G.

of the immediate neighbourhood of Trincomalee and of Batticaloa, the eastern side of the island is a *terra incognita* to the botanist.

Generally speaking, the first 2000 feet of the mountain range is covered with a dense forest of large trees, which are characterised by a foliage of a much larger size than that of the low-country forests, and nearly of a uniform dark green colour, except, indeed, when the large iron-wood tree (Mesua Ceylanica) is putting forth its young leaves, which are of a blood-red colour, and at that season give a remarkable aspect to the forest. To the general observer the trees of the next 2000 feet appear but little different from those of the first, but the eye of the botanist can at once detect many species in both that are peculiar to each. The mass of the herbaceous vegetation of both is made up of Ferns, Scitamineæ, Urticaceæ, Cyrtandreæ, and Compositæ. One of the most marked features of the second 2000 feet is the existence of large open grassy tracts on the sides of the hills to which the natives give the name of Pattanas. Such tracts extend to the highest parts of the island, differing, more or less, at different elevations in the nature of their vegetation. Scattered through the lower ones, and giving them an orchard-like appearance, are two trees which are almost peculiar to them. These are the Careya arborea and Embliea officinalis. The herbaceous vegetation consists chiefly of numerous tall, coarse grasses, growing for the most part in tufts, the most common of which is the Lemon Grass (Andropogon Schoenanthus), intermingled with which are several Compositæ, principally consisting of several species of Blumea, Knoxia corymbosa, the representative of the old and accurate historian of Ceylon, the broom-like Atylosia Candollei, and Impatiens balsamina, the origin of the common garden balsam. It is on the forest land of this tract that the principal coffee estates have been established.

The next 2000 feet, which brings us to an elevation of 6000 feet above the level of the sea, and into a region which has a much lower temperature than any of the preceding, is still covered with forests having occasional patches of Pattana, but both give support to a very different vegetation. The trees are much smaller, grow closer together, have their stems and branches covered with pendulous masses of Lichens and Mosses, and many kinds of small Orchideæ. Their leaves are mostly small, and their varied tints remind one of the autumnal forests of more temperate climes. The under vegetation consists of numerous species of beautiful herbaceous and suffruticose Balsams (Impatiens), a great variety of suffruticose Acanthaceæ (Nilu), beautiful and delicate Ferns of all sizes, from those scarcely a few inches in height to tree ones, which throw up their stems

surmounted by large masses of verdant fronds to an elevation often of 20 feet, and rivalling in gracefulness the Palms of the low country. It is in this range that the lovely tree Rhododendron, which is so common in more elevated tracts, first makes its appearance. The Pattanas at this elevation are more spongy in their nature than those below, the grasses which are peculiar to them grow more closely together, and are smaller and more wiry in their texture; while the shrubs which are scattered through them are principally species of Hedyotis and Osbeckia, the latter producing beautiful large rose-coloured flowers.

The 2000 feet which succeed to these include the most elevated portions of the island, and embrace chiefly the mountain-tops, and the valleys or plains which divide them from each other. The vegetation of this region has still a more alpine aspect than the preceding one, and of all the others is that which is possessed of the greatest interest to the botanist, from the great number of European forms that are mixed up with those whose range does not extend beyond the tropics. The tree that first claims attention in this range is the Rhododendron, not only from its great beauty, but from its vast abundance, especially in the open plains, which during the months of June and July are clouded with red from the great profusion of its blossoms. I have met with two well-marked varieties, if they are not, indeed, distinct species of this tree. One of them is principally met with in the plains or in their wooded margins, and is easily recognised by the rusty-coloured under side of its leaves. This is the variety which is so common on the open plains of the Neelgherry range of mountains in the peninsula of India. The other variety, so far as I am aware, is peculiar to Ceylon, and is always found in the forest, and at a greater elevation than the other. It is distinguished by its greater size, and the silvery under side of its leaves, which are besides narrow and rounded at the base, not broad and cordate as in the other. Several fine trees of this variety occur on the ascent of Pedrotalagalla from Newera-Eilia, and close to the temple on the summit of Adam's Peak; but the finest I have met with in my excursions among the mountains of the interior, was in crossing over Totapella, where there is a large forest of them, many of which are from 50 to 70 feet high, and with stems more than 3 feet in diameter. In these forests are also to be met with some four or five species of Michelia, the representatives of the Magnolias of North America, several arboreous Myrtaceæ, and not a few Ternstromiaceæ, the most common of which is the Camellia-like Gordonia zeylanica.

There is much here to remind the European of his native country. Different species of Rubus and a Barberry abound along the wooded margins of the plains, as well as two species of Viburnum or Guelder Rose, and a shrubby St. John's Wort

(Hypericum mysorense), bearing large yellow flowers. The dry open banks are covered with Violets and Lysimachiæ, while in the open plains are to be found two species of Potentilla, an Anemone, a Geranium, two kinds of Ranunculus or Butter-cup, a Ladies' Mantle not unlike the Alchemilla vulgaris of England, a little blue star-blossomed Gentian, two species of Sun-dew or Drosera, a Campanula, a Valeriana, and in the bogs several kinds of Juncus and Carex.

At the health station on the plain of Newera-Ellia, which is about 6200 feet above the level of the sea, there are several gardens in which most of the vegetables of Europe grow freely. European fruit trees have also been tried, but no success has attended the experiment: nor was such a thing to be expected, for although during the cold season the thermometer falls occasionally in the morning to nearly the freezing point—the annual range being from $35\frac{1}{2}°$ to 80°, with a mean daily variation of 11°–, the cold is not sufficiently intense nor of long enough continuation to give those trees the period of rest which they require. In place of losing their leaves for nearly six months of the year, the Peach and the Cherry are here evergreens, and are hence kept in such a continued state of excitement as to prevent their bearing. The Peach does, indeed, give a poor crop of fruit of a very inferior quality, but although the Cherry blossoms annually its fruit never comes to perfection.

Although the Neelgherry range, from its near geographical position, has more species in common with the tracts of a similar elevation in Ceylon than any other part of India, yet these from their small numbers are evidently only stragglers northward: the very great number of species peculiar to the mountains of Ceylon, and to them alone, proves that these mountains form a distinct centre of creation. This I shall illustrate by a few examples from some of the better known natural orders and genera of plants. Beginning with Ranunculaceæ, we find three species of Ranunculus belonging to the Flora of the Neelgherries, and two to that of the mountains of Ceylon, one species only being common to both countries. Of Magnoliaceæ, Ceylon possesses four or five species of Michelia, all of which are different from the solitary one which is found on the Neelgherries. Each country has a Violet peculiar to itself, with another that is common to them both. Both places possess about half a dozen species of Elæocarpeæ each, but only one is held in common; and the same is the case with the order to which the Tea belongs—Ternstromiaceæ. The genus Impatiens, that to which the garden Balsam belongs, affords one of the strongest arguments which can be offered in favour of the fact I am now illustrating, for while each country possesses upwards of twenty pecies, certainly not more than three are common to both, and

none of the other Ceylon species are known to exist elsewhere. Of Rosaceæ we find that the Neelgherry range has only three species of Rubus, while there are no less than eight found on the mountains of Ceylon, three of which are peculiar to them. Both countries have an Alchemilla in common, while the Agrimony of Ceylon does not exist on the Neelgherries, but is found abundantly on the Himalaya range; and I have lately described a new species of Poterium from Adam's Peak, the only one which has hitherto been met with in India. Two species of Potentilla grow in Ceylon, and three on the Neelgherries, one only of which is common to both countries. A comparison of this kind might be run on with to a great length, but enough has already been shown to prove that while the Flora of the central part of the island has more affinity with that of the Neelgherries than with any other part of the world, yet it must have had a creation of its own, nearly allied, indeed, to the other in forms, but very distinct in individuals.

Although many of the genera found in the upland regions of Ceylon are such as are common in Europe, yet none of the Ceylon species are identical with European ones. Indeed, there is not to be found growing really wild in the island, a single species exactly the same as any European one. There are, however, a few which have become more or less naturalised, having been introduced along with garden and other seeds. These are the common Sow Thistle (Sonchus oleraceus), the common Chickweed (Stellaria media), the Mouse-ear Chickweed (Cerastium vulgatum), the Corn Spurry (Spergula arvensis), and the annual Meadow-Grass (Poa annua). All these, with the exception of the first, which is much more general, are mostly confined to the plain of Newera-Ellia. In all countries plants which are introduced from others and find a congenial soil and climate, and which produce their seeds in profusion, and of a nature to be easily blown or carried about from place to place, are sure to naturalise themselves, and often in the course of a few years are not to be distinguished from those which are really original denizens of the clime. Besides those from Europe just enumerated, there are many others natives of distant tropical countries which are now rapidly spreading themselves on the island; and as it is of the utmost importance to distinguish them from those which are truly natives, I shall here enumerate all those species of which I possess sufficient evidence to establish their exotic origin, and mention the countries from which they have been brought.

The two species of Prickly Pear (Opuntia) which are now so common in dry sandy localities in the low country, are natives of the tropical parts of the continent of America, as, indeed, the whole of the Cactus tribe is. The beautiful rose-coloured Peri-

winkle (Vinca rosea), which has so completely overrun the Cinnamon gardens at Colombo, and other similar localities, is a native of the island of Madagascar, though it has now perfectly established itself in nearly all tropical countries. The climbing Allamanda cathartica, with its dark green leaves and golden bell-shaped blossoms, is a native of the Guianas, and was no doubt introduced by the Dutch. The Lantanas, which are to be met with almost everywhere in bushy places and in hedges, are natives of the West Indies; and such also is the case with the yellow-flowered Turnera ulmifolia, which is common by roadsides about Colombo. The Cape Gooseberry (Physalis peruviana), now so common about Rambodde and Newera-Ellia, is a native of the mountains of Peru. The Four o'clock Plant (Mirabilis Jalapa), common about Candy, is a native of Mexico and the West Indies; and the Ipecacuanha plant, as it is erroneously called (Asclepias Curassavica), with its orange blossoms, and seeds with long silky tails, is a South American. Most of these must have been long established before the English took possession of the country; but the following are well known to have escaped from the botanical gardens at Colombo or Peradenia during the last twenty-five years. The small white-flowered Passiflora fœtida, now so common a weed everywhere, is a native of the West Indies and Brazil, and was only introduced to the island, by Mr. Moon, so short a time ago as 1824. Two species of Crotalaria—C. Brownei, a native of Jamaica, and C. incana, a native of the Cape of Good Hope; the Mexican Coreopsis-like Cosmos caudatus; the Peruvian blue-flowered Nicandra physaloides; and the South American Sensitive Plant (Mimosa pudica), are now not only common weeds about Peradenia and Kandy, but are fast extending themselves in all directions, the first mentioned species having now nearly reached as far as Rambodde on the Newera-Ellia road. Brucea Sumatrana, a shrubby native of the Eastern islands, and an escape from the Peradenia gardens, now forms part of the low jungle on the neighbouring Hantane range, and Buddlea madagascariensis, a native of Madagascar, and two small kinds of Passion-flower (P. suberosa and glauca), both natives of the West Indies, are fast following. Ageratum conyzoides, everywhere a common weed, and one of the great pests of the Coffee Planter, is of American origin, though now thoroughly naturalized in all tropical countries.

The above, though only a rapid sketch of the more prominent features of the vegetation of the island of Ceylon, is sufficient to show the great interest and variety of the materials of which it is composed, and of the relation which it holds to that of other parts of the globe. Much, however, still remains to be done before a detailed exposition of it can be offered to the world.—*From Ribeira's History of Ceylon.*

V.—*On Transplanting large Evergreen Trees and Shrubs.*— —By R. Glendinning, F.H.S., Hon. Mem. Hort. Soc. of Queen's County, Cor. Mem. Hort. Soc. of Massachusetts, U. S. A.

(Communicated Dec. 4, 1848.)

It is not my intention here to enter upon the propriety or impropriety of employing in rural improvement large shrubs and trees. It must be at least conceded that the effect which is immediately produced by their application as screens, or in clothing naked and cheerless spots in the vicinity of the mansion, is not unfrequently attended with the happiest results. That depends, however, chiefly upon the success with which the operations are conducted, and if the specimens are large the difficulty and expense are necessarily greater, and in like proportion also is the existence of the plants put in jeopardy. The disappointment arising from the death of a few small plants is comparatively of no moment—others can readily be substituted; but when large specimens have been removed, involving a great outlay consequent on the operation, and placed in prominent positions, their death is attended with painful sensations at the loss of the plants themselves, and the total frustration of improvement together with the delay of a season besides are not the most pleasing subjects to reflect upon. It shall be my object, therefore, on the present occasion to lay before the Society the result of my experience in this department of decorative improvement, and to point out the circumstances upon which success mainly rests.

Preparation of the subject intended for removal is the first step towards a successful result. Large hollies, yews, cedars, and similar ornamental evergreens intended for immediate effect, should have their roots pruned any time before they begin to grow. In some instances it will be better to dig a trench within a reasonable distance from the bole of the tree, so as to retain a ball no larger than can be transplanted. This trench should be cut sufficiently deep all round the tree, and as much under it as may appear necessary to get at the principal roots, which should be cut through, and the soil again filled in. The wounds will be completely healed by the autumn, and numerous rootlets sent out into the loose soil. The plant will be checked in its growth and may probably become a little discoloured if it has previously been in a vigorous state of growth. It is quite true that objections will be urged to this previous preparation, because improvements when suggested are at once commenced without much consideration as to the propriety of the season; consequently the plants are removed quite regardless as to whether it is

autumn, winter, or spring, and by the middle of the following summer their appearance is often anything but evergreen. They may break again, or die, just as it happens; but then the object in view is defeated, nor could any other result be expected when we consider the violence thus incautiously perpetrated upon a subject in rapid growth, which may have stood twenty years in its former position. Nor does it appear to me that any argument can be adduced of sufficient cogency to sustain such a crude proceeding with anything like reasonable success. It may be urged, indeed, that there is some delay in allowing a summer to pass, but the delay is merely apparent.

The next point for our consideration is the proper season when the operation of transplanting should be conducted. This I consider to be a much more important matter than many people seem to imagine. The winter months, that is from the end of October to the beginning of April, have been generally recommended, indeed almost universally so. From these opinions I *entirely dissent*, how eminent soever the authorities may be who have laid them down. I quite admit that a qualified success may have attended their operations, but I deny, independently of this, that it is the right season for the execution of such work, and the slightest acquaintance with vegetable physiology will conclusively demonstrate the truth of this assertion. Let it be clearly understood that I am alluding to plants of from six to thirty feet and upwards in height, and not to mere nursery stock, which is generally kept moved about every two years, to ensure its safety when transplanted out permanently; besides, its portability enables the operator to secure a ball and the principal part of the fibres, although this work would be much more safely performed at a different season.

It would be traversing over a beaten track to enter into any general detail respecting the ascent and descent of the fluids in plants, and the formation and deposition annually of new wood in all ligneous vegetation. It will be sufficient for my purpose to state that this extension and formation takes place chiefly after Midsummer, and principally in evergreens during autumn, when the young shoots begin to attain a certain degree of consistency. It is during this downward tendency of the fluids, and when the solar action is in some measure on the decline, that I should seize and conduct with all rapidity the operations of transplanting; and, if this is intended to be conducted extensively, I should recommend the end of August as a good time to begin, September being the *safest* month in the year; selecting such plants to commence with as have matured their shoots. Another and very important reason remains to be stated why autumn is to be preferred for undertakings of this

kind in preference to winter. The force of the sun during summer, although now on the decline, has warmed the earth to a considerable degree and depth, so that the mutilated roots are comparatively situated on a gentle bottom heat, which rapidly promotes cicatrization, and frequently aids the emission of young spongelets during the current autumn.

That the season which I have here ventured to urge for the performance of the work under consideration is undeniably theoretically the right period appears beyond all question; and being no mean experimentalist in rural embellishment, with plants of considerable magnitude, I can attest also that it is practically the season to be preferred beyond all others. I had occasion to superintend the removal of upwards of two thousand trees and shrubs, all evergreen, and varying in size from six to forty feet high, during one autumn. The trees were prepared as formerly described the previous spring, and as the undertaking was rather gigantic, the work was begun in August and finished with the year. The result was of course watched with some interest, and the following summer, when an examination took place, I found that those trees which were transplanted early in the season indicated little change from their removal, but the contrary was the case with those which had undergone similar transplantation during December. In fact the gradual diminution of the motion of the sap, accompanied with declining atmospheric action, which tended, in conjunction with the usual autumnal precipitations, to cool and saturate the earth, clearly and progressively exhibited our comparative success.

The exact period to commence these operations must be determined by the nature of the season, and the state of maturity the current year's growth has attained: in some seasons an earlier beginning may be made than others; some kinds of plants also ripen their wood much earlier than others. These, therefore, should receive the earliest attention.

In hot and dry autumns the foliage of some of the larger specimens of certain species and varieties, especially such as have large and succulent leaves, will flag and droop. To guard against any injury arising from this, it will be advisable to well water the roots at planting, not with cold water from the well, but from the pond, where it has been exposed to the sun. With specimens of great rarity and value, it would amply repay the additional trouble to occasionally syringe the foliage in the evening for a short period after planting. This, however, will not be required should the weather be either cloudy or moist.

The next and concluding point I would insist upon is that of securing the plants against being moved by the wind for the first season after transplanting. Evergreens, presenting as they do at

all seasons a mass of foliage, are liable to constant oscillation in windy weather; were this permitted with those large plants newly transferred to their fresh quarters, the young roots could not by possibility lay hold of the soil: the ball with which they were moved would soon be separated from the earth surrounding it; in winter this interstice would get saturated with wet, which would occasionally get frozen, and soon rot or kill the young and delicate fibres; in spring the searching winds would penetrate, and to a certainty prove equally fatal: therefore it becomes, with these large plants, absolutely necessary to secure them against being tossed to and fro. One season's protection will generally accomplish this. To effectually sustain them in their position three stakes at least will be required; and as these stakes are not intended to be permanent, any common fir thinnings will sufficiently answer the purpose. Strong tar-yarn, with a collar of hay round the stem to guard against friction, will be found to answer the temporary end. Other modes of staking have been suggested by different individuals, and some have recommended chaining the plants in preference to either. The particular method is a matter of no real importance; but, be it what it may, much of the ultimate success will depend upon its being efficiently carried out.

VI.—*Official Correspondence relating to the Para Grass, pointing out its importance as a species capable of resisting great drought in hot countries.* Communicated in a letter to Dr. Lindley by B. Hawes, Esq., M.P.

Sir, Downing Street, Oct. 27, 1848.

I am directed by Earl Grey to transmit to you, for the information of the Horticultural Society, the accompanying copy of a despatch from Colonel Reid, lately Governor-in-Chief of the Windward Islands, with the communication to which it refers from the Inspector of Agriculture at Curaçoa, relative to the cultivation of Para grass. It occurs to Lord Grey, that if this grass deserve the character given of it, and will grow in a somewhat cooler climate than that of the West Indies, the cultivation of it in Australia and the Cape of Good Hope would be of great value; and his Lordship requests therefore to be informed whether you consider it probable that it would thrive in those colonies.

I have, &c.

Dr. Lindley, (Signed) B. Hawes.
&c. &c.

My Lord, Windward Islands, Barbados, Aug. 31, 1848.

Having learned that the Para grass is cultivated in the Government Agricultural Farm at Curaçoa, and that it might prove very valuable here, I have procured both plants and seeds of it, which are now growing in Barbados; and I have also sent both to Bermuda.

I shall here annex a copy of the letters I received along with these roots and seeds from the Inspector of Agriculture under the Netherlands Government.

I have, &c.

Right Hon. Earl Grey, (Signed) Wm. Reid,
&c. &c. Governor.

No. 1.

Curaçoa, June 14, 1848.

By Colonel W. T. D'Urban I am informed that your Excellency has heard of some particular kind of grass having been introduced into Curaçoa from South America, and is anxious to obtain some.

I give myself in consequence the honour to transmit to your Excellency, by the way of St. Thomas, a box, containing a good many plants of that valuable vegetable called Para grass, to the cultivation whereof great interest is paid on this island; whereby I take the liberty to add a translation from the Dutch, of an article on that subject, which has been placed by me in the Curaçoa Gazette of Saturday. the 20th April, 1848, and which contains directions on the mode of cultivation of the same, which your Excellency will observe is very plain and easy.

In offering the above to your Excellency, I must politely request your Excellency's indulgence for such orthographical faults as have been committed in the said translation by the pen of a Dutchman, who, in this part of the world, is but seldom in the opportunity of speaking, and thereby cultivating the English language; begging further your Excellency to believe that

I am, &c.

(Signed) E. J. Hengarde, A.D.C.,
Inspector of Agriculture.

Para Grass. (*Panicum jumentorum*, Humboldt and Kunth.)

(Translated from the Curaçoa Gazette of April 20, 1848.)

The islands of Curaçoa, Bonaire, and Aruba have always been known to suffer under the want of sufficient food for all sorts of stock which are reared on the estates, and wherefrom

the planters on these islands derive the principal means of subsistence.

The preservation of such stock, during epochs of long and severe droughts, has ever been very precarious, as being entirely dependent on the results of former good seasons, during which considerable quantities of corn-leaves and indifferent grasses are gathered, dried, and carefully stored.

Much were they to be blamed who neglected such precautions at proper times, as with the return of every dry season vegetation is not only stopped, but becomes almost entirely extinct, causing that remarkable fallow ruddy appearance in these islands which so particularly distinguishes them from other spots under the tropics.

But even these precautions have not always proved sufficient in such instances, as not only one, but several succeeding years of drought have from time to time visited these islands, during which all that had been stored of food was consumed, in consequence whereof the greatest part of stock died away. What inhabitant of Curaçoa does not bear in mind the painful recollection of the losses sustained in the years 1842 and 1843?

Though the introduction of hay from the United States took place under these circumstances, yet few but wealthy inhabitants could avail themselves of this expensive object, and this only for the preservation of but a few horses, and other animals of burden; meanwhile, all the rest of the stock which could not be properly stalled, and which remained wandering about in the fields, was lost.

This short but true picture of but a part of the shadow-side of a planter's existence on these islands, bearing a faithful resemblance to the tale of the Danaids, exposes briefly of how great necessity it is to attach more interest on these islands to the cultivation of good grasses.

In consequence, it will not be astonishing to see a few planters accede with fervour to the cultivation of this article, they being, however, limited by want of better to the cultivation of Guinea grass, which has that disadvantage of requiring during the dry season constant irrigation, by want of which it not only becomes soon hardened, and, as such, unfit to nourish stock, but is even apt to wither and fade away entirely, as is the case with mostly all other vegetation on these islands; indeed, to shoot out again with the first showers of a rainy season, but having meanwhile undergone, during many succeeding months, a total stop in growth.

In this necessity now, a good and continual article for food for stock has at length been provided; our late Governor, Baron R. F. Van Raders, Actual Major-General and Governor

of Surinam, having in the month of November, 1846, made a present to these islands of the Para grass (Panicum jumentorum, Humboldt and Kunth), about which his Excellency gives the following communication:—

"This grass continues growing under the most severe droughts, and requires, when once located, no other care, as it suffocates the vegetation of all other sorts of grass. Especially in consequence of these qualities, I have thought it would be a valuable acquisition for the island of Curaçoa and its dependencies."

In addition to this communication we can join the following particularities, extracted from 'Les Annales de la Société d'Agriculture de Martinique,' according to which the late General Bertrand, whose estates are situated in the driest part of the island of Guadeloupe, has preserved his stock during a severe drought which visited these islands some years ago, only by means of an extensive cultivation of Para grass, while at his neighbour's, and further over the whole island, where this cultivation had been neglected, almost all stock died away; and we are told that in the beginning of the year 1844, the same grass, sent by the French man-of-war schooner Gazelle, was presented to General Paez by Admiral d'Uval d'Ailly, Governor of Martinique. According to the observations in the 'Liberal of Caraccas,' this grass is far superior to Guinea grass, as it thrives in every season, in dry as in wet weather. It was considered a great acquisition for the Republic of Venezuela, where droughts often occur for more than five or six months succeeding, during which all kind of vegetation withers in the fields.

Since the introduction of Para grass on the island of Curaçoa, the same has been cultivated under different circumstances of soil and season, under which it has kept up entirely to good reputation; so that we now dare to affirm with the greatest confidence that if general attention is paid to the extension of this useful branch of agriculture, the present made by Governor Van Raders will at once become of incalculable advantages to these islands.

The cultivation of Para grass is effected by means of seed and cuttings. The stem creeping along the surface of the ground, consists of joints of from five to six inches long; at each of the joints it fixes itself in the soil, and thereby pushes one or more perpendicular stalks upwards; the creeping stems arrive sometimes to the astonishing length of from ten to twelve feet, while the height to which the perpendicular stalks arrive entirely depends on the nature of the soil, and the state of moisture of the same. To lay out a plantation of this grass it is but required to divide the stem into so many parts, somewhat below each joint, which joints are then planted in the ground, which has

beforehand been well ploughed, with the knot side about $\frac{3}{4}$ parts in the same, at the distance of $1\frac{1}{2}$ feet asunder; while afterwards, and until it has arrived at the proper height, no other labour is required but weeding.

On the Government estate "the Hope," Para grass was cultivated as a trial in low land of black garden soil, and also on higher situated, hilly, very unfertile soil: in the first instance it has grown up into an almost impenetrable mass, which having been cut already several times, has every time, however, pushed up again with renewed vigour; in the other instance it has grown up quite as well, though much later planted; in both instances, however, without application of artificial irrigation; while as a particularity of its nature may be mentioned that it will not thrive at all in the shadow of large trees, and but indifferently in very moist places.

Equally favourable results have been obtained on different other private estates on this island, where the same materials have also been taken, and where, as well as on the Government estate before-named, Para grass for planting can now be had on application by whoever should desire to occupy himself with the cultivation of the same.

From whatever side the cultivation of Para grass is envisaged, it certainly merits the greatest recommendation. As green food for stock, it retains under the most severe droughts all favourable properties; and cut and dried it yields, if not allowed to grow higher up than two feet, an excellent and by all stock much-liked fodder, which principal quality recommends it far above Guinea grass, which cannot be laid up as hay. Taking further in consideration that during the short rainy season, which on these islands seldom lasts longer than three months, Para grass can be cut upwards of two times, then certainly all further recommendation of the same becomes superfluous: we consequently beg to conclude this article with calling to the remembrance of the planters that beautiful encomium, "that he who raises two stems of grass where formerly but one did grow, becomes a benefactor to mankind."

(Signed) E. J. Hengarde, A.D.C.,
Curaçoa, 16th April, 1848. Inspector of Agriculture.

Sir, Horticultural Society, 21, Regent Street, Oct. 28, 1848.

I have to acknowledge the receipt of your letter of yesterday, transmitting for the information of the Horticultural Society some enclosures from Colonel Reid concerning the Para grass. The plant itself—Panicum jumentorum, otherwise

called Panicum maximum—is well known. I have it from the Isle of France and Martinique. It is said to be of African origin, and is now, according to Humboldt, cultivated all over South America for cattle. It is a species with a soft, succulent, nutritious herbage, and therefore of great value. Its power of resisting drought is a new fact, and is so well attested by the evidence which Lord Grey has transmitted that I do not hesitate to advise his Lordship to cause it to be introduced to Australia experimentally. There is only one thing in that country which is likely to interfere with the success of the trial, viz. the lower temperature of the soil than in tropical America. But grasses have a great aptitude for reconciling themselves to differences of climate; and various species of Panicum, one of which is not very unlike the Para grass, already inhabit the whole breadth of Australia. I therefore regard the experiment as being eminently deserving his Lordship's favourable consideration.

I have, &c.

JOHN LINDLEY,
Vice-Secretary.

B. Hawes, Esq., M.P.

VII.—*The Aëration of Vineries, as practised at Bowood, the seat of the Marquis of Lansdowne*, F.H.S. By John Spencer, C.M.H.S., Gardener there.

(Communicated Dec. 6, 1848.)

THE imperfect manner in which many of our forcing-houses are ventilated is a constant cause of complaint amongst gardeners, and various plans have of late been recommended to remedy the evil and to dispense with the usual mode of letting down the roof-sashes every time air is to be given. Having occasion during the autumn of 1847 to replant an early vinery, I took the opportunity of arranging the aëration of it in accordance with the plan which accompanies this paper, and it has so far answered my expectations, that I now venture to submit it to the Council of the Horticultural Society, as a means whereby structures of this description may be efficiently aërated at all times and at a trifling expense.

By a reference to the plan it will be seen that the house in question is one of the common *lean-to* description, and was placed against a wall previously erected, which will account for its unnecessary thickness. The chamber containing the heating apparatus runs the length of the house (see *f*), and into this

chamber, and immediately below the flue,* are conducted the cold air drains, both from the back of the house and also from an air drain *d* running the length of the house underneath the vine border. This central drain communicates with the external air by two drains *h h*, which are protected by a wire grating. Both sets of drains are furnished with sliding valves made of slate, working in a groove *m n*: to each valve is fixed an upright wooden bar furnished with holes, and by means of a pin the admission of air can be regulated as wished. In addition to these drains there are five ventilators in the back wall of the house *g*. These are made to slide in a frame, and are connected together by an iron rod, having at each end a weight attached, by moving which the whole of the ventilators are acted on simultaneously.

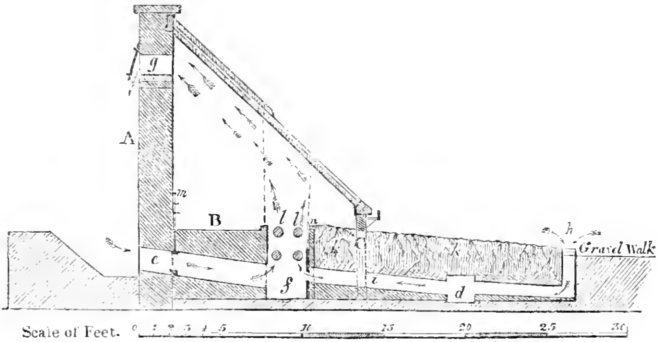
It will be seen by the above description that when the valves *m* and *n* are raised and the back ventilators opened, a current of air is immediately admitted beneath the heating medium, and thus gets warmed before coming in contact with the foliage of the vines. The general direction of the warmed air is naturally towards the back ventilators. During the winter months and in dull weather these valves require only to be slightly raised, keeping a continuous current through the house without lowering the temperature: during bright sunny days I open the whole of them, when of course a more rapid circulation of air takes place; but I do not find it necessary to open the top sashes until the weather becomes sufficiently warm that air may be admitted without any fear of its injuring the foliage by direct exposure to its influence, which often occurs to vines in leaf when the sashes are lowered in *cold* though bright weather during winter and early spring. I may mention that had I had the entire building of the house in the first place, I should have preferred building the back wall sufficiently high to have left room for the back ventilators to have opened above the wall plate and immediately under the coping, to remedy the evil in the present case of a direct current of cold air passing through. I have attached on the north side a frame which prevents the air entering the house directly from the outside.

I need not advert to the beneficial effects a constant supply of warm air in rapid motion must have on the health and fertility of plants, particularly of vines and other exotic fruits forced through our comparatively long and dull winters, as these facts are sufficiently established by our highest authorities, and the short though conclusive experience I have had with the mode I have described convinces me that the above principles might be carried out in nearly all our forcing-houses with the most decisive

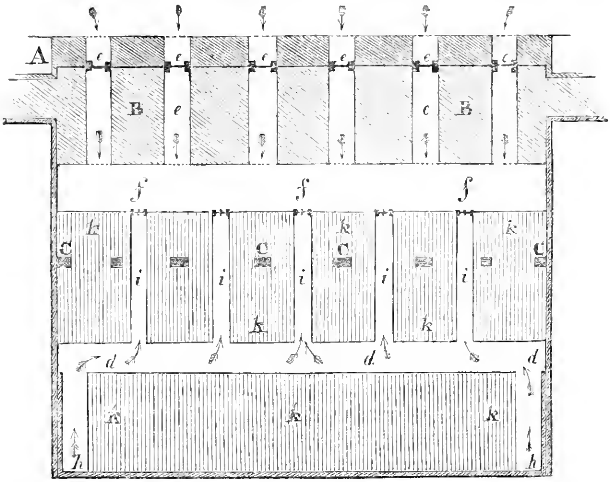
* Lest it may appear strange to speak of a flue here, while I have shown hot-water pipes in the section, I may mention the flue is merely temporary, and will be replaced by hot water when the vines are strong enough to force.

results. I am now taking steps to adopt nearly a similar plan in aërating a different description of house, and which may form the subject of another communication.

SECTION OF VINERY AT BOWOOD.



GROUND PLAN.



Reference to Section and Ground Plan.

A. Back wall of house. B. Floor of house.
C. Supports to front plate.
d. Large air-drain running parallel with the house.
e. Air-drains entering from behind.
f. Open chamber for hot-water pipes, or flue.
g. Ventilator in back wall.
h. Drains for admitting external air to *d.*
i. Air-drains communicating with *d* and opening into *f.*
k. Border for vines. *ll.* Hot-water pipes.
m. Sliding-valves for regulating admission of air through drain *e.*
n. Valves for admitting air from main drain *d.*

VIII.—*The Pear as regards its Stock.* By R. Errington, C.M.H.S., Gardener to Sir Philip de Malpas Grey Egerton, Bart., M.P., F.H.S., at Oulton Park, near Tarporley.

(Communicated Nov. 1848.)

When we take into consideration the conflicting character of the reports on Flemish pears from various parts of the kingdom, and even from the same neighbourhood, it is evident other causes must be at work besides the mere question of heat. Some years since, when any difficult kind came to hand, or at least any kind thought too tender for an ordinary standard, it was at once assigned a place on the walls, and not unfrequently in a very warm aspect. Subsequent experience, however, has proved that the latter resort was frequently an extreme as fatal in its consequences as the former.

The consideration of such matters is at once suggestive of an examination of the Stock question.

Mr. Rivers and other nurserymen are beginning to work extensively on the Quince; and I feel persuaded that if the habit of the quince was duly considered, and the soil adapted accordingly, the result would be a much higher amount of success than is at present attained. I do not wish it here to be inferred that I would advocate the total banishment of the pear stock from our gardens—not by any means. What I would urge is, that most of the Flemish kinds which are not found to succeed in a satisfactory way on the wall, would probably be much improved if grown as dwarf standards or pyramidal trees, providing proper means were taken to subdue, and continue under control, their tendency to produce superfluous shoots. The production of such shoots constitutes the principal reason why the fruit becomes unsatisfactory. The tree is in exciting soil, perhaps, with unlimited power to range in quest of food; the necessary consequence is, that abundance of breast-shoots are formed. Now it so happens that the amount of foliage on such breast-wood is not an iota more than is requisite to elaborate the great amount of watery juices thrown into the system. No. Nature, true to her principles, produces no more foliage than is necessary for a due amount of reciprocation between the root and the branches. The tree is half-stripped of its elaborative powers at the moment they are most needed, and the consequence is large fruit filled with half-elaborated juices. The gardener, to be sure, is obliged to cut away the breast-wood, or general barrenness would be the result; but methinks it makes a man look very silly to be constantly employed in wheeling good soil to plant trees in, and in wheeling gross breast-wood back again.

I feel persuaded that, by a proper dwarfing system, there would be little occasion for disbudding—indeed, I have proved this to my entire satisfaction for years. There are three ways of arriving at this end: the one by using the quince stock; the next by the free stock in a limited amount of soil; and a third by root pruning. Now I have no particular objection to root pruning, having practised it extensively for the last nineteen years. It will, indeed, succeed on all gross subjects, *if healthy;* but if the soil has been prepared too deep, too wide, or too rich, root pruning has to be repeated; and even then, very moist growing seasons will frequently carry the tree beyond its bounds.

The free stock, with a very limited amount of soil, offers another chance of striking at the root of the evil: if, however, the limitation is very severe, and the soil too light, there arises another source of failure; the fruit in a hot and dry summer may become stunted, and crack. To be sure, top-dressings will obviate these things; but it would be preferable so to establish pear trees as that they would require little or no assistance in the way of labour.

We come now to the quince stock; and to this I would beg to draw particular attention. I think that there can be no doubt of the general success of the quince, providing those who adopt it could be prevailed upon to prepare the stations for its reception with some regard to the habits of the quince.

It will be at once admitted that the great object here is to provide a congenial soil for the stock; this done, the success of the graft will follow as a matter of course.

One thing is of much import to the quince, viz., a permanency of moisture in the soil. The finest, largest, and best bearing quince trees I ever saw were growing in an unctuous, yet gravelly soil, of a dark colour. Holes opened in the neighbourhood of these quinces would become half filled with water during the night through most of the year. I do not, however, wish it to be supposed that it is desirable to go to this extreme. The texture of the soil is perhaps the only thing requisite to attend to in preparing stations, and this should be somewhat tenacious and rich in humus. By the term tenacious, I merely mean the power of retaining moisture sufficient to withstand a long dry period. The scourings of ditches on strong loamy soils, especially if near trees, and possessing a considerable deposit of leaves, would be excellent dressing. In fact, the alluvium found near the bed of pools or other waters, and of which most persons could avail themselves, would no doubt answer well as part compost.

Some years since I commenced an attempt to form a soil arti-

ficially, containing all the essentials for quince culture. Permanency of moisture, an unctuous feel in the fingers, together with a liberal amount of fine sand, seemed to offer the most ready means of carrying out the object. Permanency of moisture was in the main represented by using a fat or unctuous loam to the extent of a half-component part. The unctuous, or perhaps I may say soapy texture, I imparted by a liberal addition of very old vegetable matter, containing old tan, peat, and some rich old humus; sand added afterwards. Some six barrowsful were blended, and formed a station 18 inches deep by 6 feet square, on a brick or stone substratum; the surface of the soil merely the ordinary ground level. I planted a Beurré d'Aremberg—or at least it is either that or Glout Morceau—on a quince, and the success has been most complete. The tree has annually borne abundantly fruit of very excellent flavour, and melting; indeed, one season it surpassed in flavour even the Winter.

I hold it good pear culture to make a practice annually of selecting the shortest jointed and most mature annual shoots, and tying them down to the principal leaders in the June or July summer-pruning. The old and mechanical spurring system is surely exploded by this time; it has proved a most fallacious course of practice for centuries, and the gardener who adheres yet tenaciously to it must be much attached to mere prescription. I do not say, spur not at all. No. When natural spurs continue to form, and advance into blossom buds, by all means preserve them, but do not entirely rely on them.

Notwithstanding the eligibility of the quince for a dwarfing system, I still think that the results of grafting on the pear stock would be very different, providing means were taken from the very seed-bed to check the tendency to forked and deep roots by early and frequent transplanting. Plenty of fibrous surface roots thus obtained would, without any further difficulty, place the stock under an amount of control which would in all probability render it equivalent to the quince as to dwarfing matters; whilst for the most part any ordinary soil would suit it, which cannot be said of the quince.

The great tendency to produce breast-wood is the main evil to be avoided; indeed, let any one only observe the old orchard pear-tree of possibly many centuries. I have witnessed many, very many, which have borne some ten to twenty bushels of perfect fruit annually, and which have never within my knowledge produced above four or five inches in length of young wood each summer—in fact, I know of some in which it is scarcely possible to notice any elongation at all. The joints, moreover, are so close together that four or five may be found

in the compass of an inch; whilst in the pampered tree of the kitchen garden one joint or node alone will frequently occupy more space.

The proper ripening of pears in the room is, moreover, a matter of great importance, and about this I conceive we have all much to learn. It is quite probable with me that scarcely any two require precisely the same conditions of warmth to do them justice. This, if correct, is a necessary consequence of hybridisation, every pear, of course, being intermediate between some other two kinds, at least for the most part.

The critical period, that makes or mars them, is, I conceive, when they first show a tendency to mellowness for the table. At this period, if their ripening is arrested for the sake of retarding them, it is almost sure to be at the expense both of their flavour and their melting properties.

If I were to build a fruit-room for myself, I would have a door at the further end leading into a pear-closet, in which I would have a slight amount of artificial warmth at command. The pears should all be on movable trays, and these trays, when required for use, should be removed a week or so previously, without disturbing the pears, to the warm room. A temperature of 60° to 65° would perhaps be sufficient.

IX.—*On the Cultivation of Celery.* By W. Cole, Gardener to H. Colyer, Esq., Dartford.

(Read at the Meeting, December 5, 1848.)

HEREWITH I take the liberty of handing you six sticks of celery, of a kind which I have grown for the last three years, and which I think both in point of size, solidity, and flavour will be found superior to any which has hitherto been cultivated. The specimens sent are not selected, but are merely examples of a general crop, planted without any object in view beyond that of the supply of my employer's table, and entirely without ever thinking of sending any of it for public exhibition. My stock consists of six hundred plants, planted in rows, four feet apart, and the plants nine inches apart in the row; and I have not a doubt that the whole crop would average six pounds per stick. Not the least remarkable excellence in this celery is, that it will stand twelve months without running or starting for seed, and such a thing as a pipy or stringy leaf I have never noticed so long as I have grown it. For a more circumstantial detail of my method of cultivation, I may remark the seed was sown the first week in February, and so soon as the plants were large

enough they were pricked out in garden soil, rich in vegetable matter, under hand-glasses. The trenches were prepared in the usual manner in the first week in June, by excavating them nine inches deep, and digging in a good dressing of the spent dung of an old mushroom bed. The plants were of course strong when they were planted out, and each was removed to the trench with a good ball of earth adhering to the roots, so that (afterwards receiving a copious watering) they sustained little or no check. In earthing celery I generally endeavour to steer between the two extremes of frequently earthing, and earthing only when the plants are full grown, believing that a little earth after the plants are fully established in the trenches, say a month after planting, promotes the rapid growth of the plants, more especially if they receive a good soaking of weak liquid manure or soot-water a day or two before they are earthed. Soot-water is an excellent manure for celery; and where worms and other insects are troublesome, a little dry soot dashed along the rows will be found a preventive of their ravages. The kitchen garden here being upon a boggy subsoil, and below the level of the river Dart, which passes through the grounds, I do not find it necessary to water the plants more than once or twice after they are planted out; but in more elevated situations it is almost impossible to give too much water, always, however, preferring to give a thorough soaking once every fortnight rather than daily dribblings, which in my opinion do more harm than good. Were I so disposed, I have no doubt I could grow this celery double the size of that sent; and to effect this I should prepare the plants as before directed, excavate the trenches eighteen inches deep and the same in width, and fill them with a compost consisting of good turfy loam, peat, and leaf-mould, or thoroughly decomposed cow-dung, in about equal quantities. Very rich dung is not good for celery, and strong manure-water should also be avoided. To grow large celery, it would be necessary to place the plants eighteen inches apart in the row, and the ground should be kept constantly stirred about the plants, taking great care, however, to prevent the soil getting into the hearts of the plants during the operations. In a late number of the 'Journal of the Horticultural Society' I perceive Mr. Errington attributes the coarse and bad quality of the large celery grown for market to the luxuriance of its growth. Here I venture to assert he is wrong. The bad quality of the celery is attributable to the bad kinds grown, as I am quite sure no person could grow this kind of celery, which has been named *Cole's Superb Red*, so as to make it either pipy or stringy or inferior in flavour. Late earthing has more to do with making celery stringy than anything else, as it is quite certain if the leaves of celery are exposed

to full light and dry air for a length of time, the tissue will become harder than if the leaves were grown in comparative darkness. We need no stronger proof of this than the acrid flavour of the outer as compared with the inner leaves of the same celery, a fact demonstrating that if the leaves are exposed for a long time they acquire an acrid flavour which no blanching can wholly remove.

For an early crop of celery I sow in heat early in January, and prick the plants out upon a slight hot-bed: for a second crop in February in heat as before directed, and for a late crop in March in the open garden.

[NOTE.—This communication accompanied some very fine red celery, to which a Certificate was awarded.]

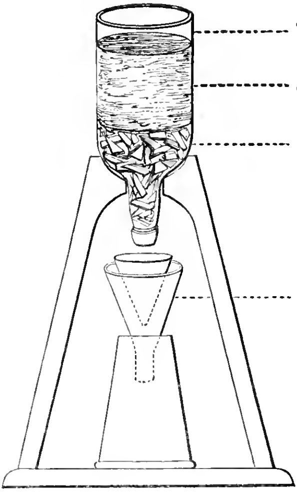
X.—*Experiments on the Growth of Plants in the Pure Earths, and also with Stimulants and Manure, made in the Years* 1843-44. By W. H. Pepys, F.R.S., F.H.S.

(Communicated February 18, 1845.)

The Earths employed were	Silex	75	White Sand.
	Alumine . . .	15	Pipe-clay.
	Carbonate of Lime	10	Whitening.
		100	

The pots in which the experiments were made were green wine-bottles, cutting off their bottoms and reversing them on a stand for that purpose. (See figure, in next page.)

April 26th, 1843.—The first experiment consisted in mixing the earths in the proportions described, and having placed some broken green glass as crocks in the glass pots, they were nearly filled with the mixed earths. Three yellow lupine-seeds, each weighing $2\frac{6}{10}$ grains, were then planted about half an inch deep therein, and watered with 3 oz. 5 drams of distilled water and exposed to the atmosphere. They were watered every day until the 29th of May, with from half an ounce to an ounce of distilled water; and on that day one of the seeds broke ground, only the cotyledon making its appearance; the watering was continued, and on the 5th of June a small plume appeared, but very weak, which increased but very slowly. On the 10th of July the plant had six leaf-stalks, of six leaves each; and on the 1st of August, the plant being very weak, with eleven leaf-stalks, and no sign of bloom, it was removed from the vessel,



and weighed $42\frac{5}{10}$ grains. From the plan of the glass-pot it will be seen that the distilled water, after its passage through the pot, could be examined as to any alteration in its quality: it was so tested, and with

Litmus	No reaction.
Brazil Wood . . .	None.
Prussiate of Potash .	None.
Muriate of Baryte .	None.
Nitrate of Silver .	Very slight.

In one of the same glass pots filled with peat and loam three lupine-seeds of the same weight were planted and watered with cistern-water each day, and on the twentieth day from planting broke ground; only one was suffered to grow, which was strong and healthy, and on the fortieth day from its breaking ground had twelve leaf-stalks, with six to seven leaves each. Twenty days after it showed for flower, and being taken up weighed $192\frac{5}{10}$ grains.

April 28th, 1843.—Planted three lupine-seeds, 2 grains weight each, in the pure earths; watered them with a solution of guano (1 oz. to 20 oz. water); continued the watering to the 14th of June without any appearance of the plants, examined the earths and found the shells of the lupine-seeds, the whole of the pulp in the interior having disappeared.

June 30*th*, 1843.—Planted twenty mustard-seeds in the pure earths, watered them with distilled water, and on the 5th of July two of the seeds broke ground very weakly; continued the watering, and on the 7th two more appeared; continued the process until they gradually decayed, which took place in a few days.

October 5*th*, 1843.—Planted three lupines in the pure earths as before described, watered them with a solution of sub-carbonate of ammonia ($\frac{1}{2}$ oz. to 1 quart of water); continued the watering with the same solution for thirty days, without any appearance of the plants, examined the earths and found the lupine-shells.

October 5*th*, 1843.—Planted three lupines in the pure earths, watered them with solution of muriate of ammonia ($\frac{1}{2}$ oz. to 1 quart of water); the plants not appearing after thirty days, examined the earths and found the shells of the lupine-seed.

April, 1844.—Planted three lupines, 2 grains each, in the pure earths, in which 30 grains of guano had been well mixed, watered them, and continued to do so every other day, and on the fourteenth day one lupine broke ground, and on the sixteenth day the other two appeared: continued the supply of water when required, and on the 11th of June, as some of the leaves were faded, gave 20 grains more of guano as a top-dressing: in the course of three or four days it was evident that the top-dressing had improved the leaves, except the faded ones, which never regained their colour: continued the regular watering, and on the 15th of July they began to show for flower; on the 25th they were removed from their glass pots, and the roots shaken out from the adhering earth. The three plants weighed together 200 grains.

$$\left.\begin{array}{ll} A, & 103 \\ B, & 49 \\ C, & 48 \end{array}\right\} 200.$$

April, 1844.—Planted three yellow lupines (2 grains weight each) in the pure earths, in which 30 grains of Daniell's Manure had been well mixed, watered them, and continued so to do every other day. On the 19th of April one broke ground: kept up the supply of water, and on the 10th of June gave a top-dressing of 20 grains more of Daniell's Manure, as the plant had always been of a stunted growth. On the 21st of July, as it had not improved, it was taken up; it weighed 14 grains.

April, 1844.—Planted three lupines, 2 grains each, in the pure earths, well mixed with 30 grains of soot; watered them,

continuing the supply until the 14th of April, when the whole three broke ground and grew well. On the 10th of June gave 20 grains more soot as a top-dressing: though the soot remained, without apparently mixing with the earths, yet the plants improved by this treatment, and on the 25th of July showed for flower. Upon removing them and shaking out the earth from the roots, the three weighed 215 grains.

$$\left.\begin{array}{l}A,\ 98\\ B,\ 60\\ C,\ 57\end{array}\right\}\ 215.$$

April, 1844.—Planted 3 lupines, 2 grains weight each, in the pure earths, well mixed with 30 grains of nitrate of potash; watered, and the supply kept up until the 10th of June; no appearance of a plant; the earths then examined, and the shell or covering of the seeds found empty.

The same experiment as the last, only 30 grains of nitrate of ammonia mixed with the earths, the same result followed. The shells or covers of the seed left weighed $1\frac{5}{10}$ grains.

XI.—*On the Cultivation of Ipomæa Ficifolia, with a view to its Flowering in the Conservatory during the Summer and Autumn Months.* By James Duncan, C.M.H.S., Gardener to Joseph Martineau, Esq., F.H.S., Basing Park, Alton.

(Communicated Aug. 17, 1848.)

To keep up a semblance of perpetual spring in ornamental structures, chiefly devoted to the cultivation of large specimen plants growing in the open borders, is an object, the attainment of which involves not only a considerable number of plants to flower at various periods, but a diversity of height and colour, which will at all times produce a display of considerable variety and contrast in every part of the house.

As the month of June approaches, not only the Camellias but most of the Acacias and other allied genera will have performed their functions of flowering. The large tub and pot specimens too of Chinese Azaleas and Indian and hybrid Rhododendrons, which had kept such structures in a blaze of flower for several months previous to this period, will now be on the wane; and to supply this deficiency of flower after the majority of the permanent specimens are in their season of growth, I have had recourse to many of the climbing plants usually cultivated in

stoves, but to none could I point with such certainty of success as to the beautiful and interesting Ipomæa ficifolia, which is usually in flower in the conservatory here from June to December. It has the merit over others of its genus of not being too rampant in growth nor sparing in its flowers: the latter too stand out well from the foliage, and although only of a diurnal character are replaced almost without intermission. This species was introduced some eight or nine years since by the Messrs. Salter and Wheeler, of the Victoria Nursery, Bath, and is figured in the ninth volume of Paxton's Magazine of Botany, and described as being well suited to pot culture in a moderate stove-heat. By the system, however, which I have pursued, I have found it a most valuable acquisition to the conservatory during the summer and autumn months.

The routine of culture which I have practised for several years is to strike cuttings in the early part of the previous season to that in which they are required to flower; they are then shifted into a three-inch pot and grown in the cutting-frame. When the pots are sufficiently filled with roots the plants are again shifted into six-inch pots, using light sandy mould on both occasions; they are then placed on the front shelf of a coal-stove. in which the thermometer frequently falls as low as 40° during the early part of the winter. About the beginning of February the plants are shifted into twelve-inch bottomless pots, using rough peat and yellow loam in equal quantities, together with a small quantity of decomposed leaf-mould and silver-sand: they are replaced in their former position in the stove, the heat in which is raised as the season advances. A piece of strong cord is attached to the pots, and continued up the roof immediately under the glass; it is then fixed to the back wall, and on this the shoots are trained as they grow. When their period of removal to the conservatory has arrived, which is usually early in June, they are readily taken from the roof, and all intertwining with other plants, or on the wires, is thus prevented. The pots are plunged to the rim in the conservatory border where they are intended to grow, and a brass chain is suspended from the roof immediately over the plants, and to which the cord is readily fixed. The shoots soon intertwine with the chain, and a column of rich purple blossoms, which are ever present, is thus created, forming a striking relief to the masses of foliage which exist at this period of the year.

XII.—*Account of Experiments made in the Garden of the Horticultural Society, in* 1848, *with reference to the Potato Disease; together with some Observations on the same.* By Robert Thompson.

From a comparison of symptoms connected with the disease as exhibited by the crops of 1847, and those of the two previous years, hopes were entertained, when drawing up a Report on the subject twelve months ago, that the disease was on the decline. In Vol. III. p. 63, it is remarked that, contrary to expectation, some very fresh, healthy foliage was produced in the course of July, 1847, by stems that had been prostrated by disease; that healthy tissue was in many instances protruded over the cankered portions of the underground parts of the stems; and that fresh roots were subsequently emitted. In that season too there was a sprinkling of fresh foliage remaining in many instances till the natural period of decay in autumn. These symptoms, compared with the prematurely total destruction of the haulm in the two preceding years, 1845 and 1846, were considered favourable. In those years the decay of the haulm was more rapid in some cases than in others; but in all cases the progress of the disease, whether fast or slow, was still onward: there was no temporary revival of the normal powers of vegetation exhibited by the stems and foliage after the blotches began to appear on them. But the improvement, evidently commenced in 1847, continued only for a short time in the present season, and then was completely reversed, owing most probably to the excessively wet period which ensued after the young tubers were formed. A considerable quantity of rain fell in the months of March and April, but May was unusually dry, scarcely 3-10ths of an inch having fallen during the whole month. In fact, the potato plants were then in want of moisture. Of this they had a sufficiency in June and July. The quantity of rain in these months was respectively 3·20 and 2·21 inches, the former being 1·3 inch above the average, the latter somewhat below the average. In the yet precarious condition of the potato, a quantity of rain below the average would probably have been more suitable; but still what did fall seemed not to injure materially the constitution of the plant, for intervals in which the atmosphere possessed a considerable amount of dryness were frequent. In August there were only five dry days throughout the month, and 4·70 inches, nearly double the usual quantity of rain, fell. Had the constitutions of the plants been perfectly sound, the tubers would have been watery, excepting on open, dry soils; but the tissue was not sound, and consequently incapable of digesting such excess of moisture, and the putrescent form was

rapidly manifested. This was not the case in the previous dry season. Had the weather proved dry in August, there is every reason to suppose that the crop would have been tolerably sound and abundant. The disease, it is true, could be detected on the underground portion of the stem in many instances in June; but notwithstanding this the fibres of the roots were sounder and more abundant than in the two previous years, at the same period of the season.

The accompanying table contains statements of the produce of a number of varieties cultivated in the usual way, but differing considerably under the same circumstances in the amount of sound produce; and I have to observe that the soundness of any particular variety in one season is no sure criterion that the same variety will be equally exempt from disease in another season. For example, the Jersey Blues produced, in 1846, upwards of fifteen tons per acre sound, whilst in the present season their return was scarcely half a ton of sound tubers. Other results in the table are from varieties treated experimentally with reference to the disease. All are given as they were actually weighed; and from these data the calculations per acre have been made. The rate per acre not only affords a uniform standard of comparison, but likewise the most familiar idea of the amount of produce, sound and diseased. The results are numbered for convenient reference. The rows were everywhere $2\frac{1}{2}$ feet apart; cut sets were employed, and planted 6 or 7 inches deep, and about the same distance from each other in the rows. No manure was applied; but Nos. 1 to 36 inclusive were grown in kitchen-garden soil previously manured for vegetable crops.

In the results 1 to 5 the quantity of diseased tubers was nearly double that of the sound. Cruckshank's Early, a variety selected as affording a fair sound produce in former years, proved the worst diseased in this quarter, in which Thurstone's Conqueror yielded by far the best and largest amount of produce; but this, in its turn, may in another season yield the reverse, such is the precarious nature of the disease. Many of Nos. 1 to 4 were totally rotten, so that it was impossible to take them into account.

The produce of No. 14, three rows of Jersey Blues, was little more than 7 cwt. per acre; No. 16, the same sort, produced only half a ton sound. The average of these four rows was 8 cwt. 62 lbs. sound, and 5 tons 19 cwt. 82 lbs. diseased per acre. An intermediate row of Jersey Blues, treated according to Meÿer's method, gave at the rate of about 3 cwt. less of total produce per acre; but instead of only 8 cwt. 62 lbs., which was the average of sound per acre afforded by the rows on each side of it, the sound produce of Meÿer's row, No. 15, was 2 tons 17 cwt. 57 lbs., or

more than seven times the quantity of sound tubers produced by the rows on each side. Such being the fact, it becomes desirable to explain the method adopted, by some extracts from a pamphlet entitled 'Treatise on a Method of Managing the Potato Plant, with a view to Saving the Present Crop from the Ravages of the Disease; being the Substance of a Communication made before the President and Council of the Royal Society of Agriculture of England. By H. L. Meÿer.' This author says—

"I propose a method of protection, which, I think, may be equally effective against any one of the above-mentioned causes of the disease, whether animal, vegetable, atmospheric, or electric. I propose to cover up the plant with the readiest material at hand,—namely, the soil it grows in. The manner in which this must be done is, by laying down the haulm, and covering it over with earth from the root to within a few inches of the extremity, leaving only the tips of the plant exposed to the benefits of light and air.

"A field, when thus treated, presents to view a succession of ridges of earth and valleys; the ridges contain the potatoes and the stems of the plants earthed over, and in the valleys or furrows lie securely the tips of the foliage. Should the injurious blight occur while the field remains in this state, the tops of the plants are greatly sheltered from its influence by the ridges of earth they lie between. Nothing further will be required but to watch the field, and continue to cover up the haulms from time to time, so as to keep only the tips exposed.

"The process thus described should be immediately put in practice, instead of the usual method of 'earthing up,' and while the stems of the plant are still pliant and manageable. This simple process will not require any outlay, and in point of labour only stands in the place of the usual method of earthing up. . . . The best way of putting this mode in practice is, by laying down the haulms with the hand, and afterwards covering them with the earth that lies between the rows.

"The earlier the plant can be attended to, as I have proposed, the less it is liable to receive the germ or inoculation of the infection; but owing to the present advanced state of the plant, it may be advisable to administer lime or some other purifying substance before covering the haulm.

"It is desirable to lay the stems down in a direction away from the east, as much towards the south-west as possible, because it is from the east that blights of all descriptions appear to originate.

"The usual manner of planting potatoes being in rows only sufficiently apart to allow room for the underground shoots and

tubers to vegetate, it will be found necessary to lay the haulms of the plant down in a slanting or oblique direction, so as to let the exposed tops of the haulm reach only to the centre of the valley or furrow, thereby gaining the double advantage of room and protection."

In the absence of the diagrams which accompany the pamphlet the mode of inclining the tops will be sufficiently understood by supposing the rows to run north and south; then the haulm will be laid, not pointing to the west, but to the south-west.

No. 18, a variety of potato from Norway, planted in the same quarter, afforded more sound produce than the other variety treated in the usual way.

Results Nos. 20 to 33 are from a number of seedlings, the produce of which proved all badly diseased, affording additional proof that seedlings are as liable to be attacked as old varieties. No. 30 was raised from a variety received two years ago from the north of Finland, the tubers being sound after enduring the sea-voyage, packed in the hold of the ship.

Nos. 37 to 54 were from drier soil in the Experimental Garden. The tubers were planted whole in hills, as suggested by the raisers of the varieties, Messrs. Hardy and Sons. It appears that planting in hills was disadvantageous in this instance; as was also the case in 1847 (see Vol. III. p. 55). The average sound produce of Nos. 37 to 45 was 4 tons 10 cwt. 66 lbs. per acre. The same sort planted in rows, Nos. 55 to 58, averaged 5 tons 13 lbs. In hills the diseased portion averaged 5 tons 1 cwt. 3 lbs. per acre; in rows only 1 ton 17 cwt. 56 lbs.

Nos. 55 to 65 exhibit the results of the method proposed by Dr. J. F. Klotzsch to protect potatoes against disease. It consists essentially in this: "During the fifth, sixth, or seventh week after the tubers have been planted, or in the fourth or fifth week after the planting of rooted shoots, or at any time when the young plants have reached a height of six or nine inches above the ground, the tops of the branches are lopped or clipped [pinched off] by means of the thumb and first finger, to the extent of half an inch. This operation must be repeated the tenth or twelfth week after planting, it being immaterial at what hour of the day." The ground for experimental purposes in the Society's garden being limited, the sets for this experiment could not be planted so early as would have been desirable. They were planted the first week in May. When between six and nine inches above ground the plants were treated according to the above recommendation. But by the time that the operation ought to have been repeated, it had been severely performed by the disease. The results, however, give on the average a slight balance in favour of stopping. The method seems to

deserve further trial, especially as regards plants growing in soils which induce an over-luxuriance of haulm.

Nos. 66 to 103 refer to an experiment tried August 9th, consisting in pulling up the haulm, which was considerably decayed, and then beating and rolling the rows. Every alternate half-row was thus treated, the other half of each row being left for comparison. The rows ran north and south. The half of the first row at the south end was rolled, the north end of the next, the south end of the third, and so on alternately. The average sound produce was somewhat less in the rolled than in the unrolled portions; but the quantity *diseased was not half so great in the rolled portions* as it was in the unrolled.

The tables to which these references belong will be found at p. 70 and the following.

An experiment was tried, September 2nd, of dusting the foliage with sulphur. It appeared to hasten the decay of the stems and foliage, and the comparative results were decidedly against the sulphured portion.

Amongst all the remedies which have been tried against the disease, none appear to have been completely effectual. While the cause of the malady is involved in mystery, any remedial application must be considered as an affair of chance. It is well, notwithstanding, to try various remedies; for some of the most valuable discoveries have been obtained by accident. It is likewise proper to record even the failures of supposed cures, in order that other trials and substances may be substituted. Various theories respecting the cause of the disease have been propounded and strenuously advocated, but there is still room for conjecture; and even if these should prove wrong, some of them may nevertheless give rise to others nearer the truth. With this view of the subject, I may be allowed to add a few remarks.

There is perhaps no article of food so extensively cultivated over the surface of the globe as the potato. Wheat has a wide range of climate; but the potato succeeds, or did succeed, in higher latitudes than it. Co-extensive with the range of the potato appears to be the influence of the disease. It has occurred in all quarters of the globe. It did not commence by attacking some particular variety, in a particular locality, and thence progressed along with the extended cultivation of that infected sort; for the propagation of no one variety could keep pace with the spread of the disease. Old varieties and recent seedlings were, generally speaking, indiscriminately attacked; and whether tubers were brought from the native country of the potato, or seeds of it from the antipodes, it was no guarantee that their progeny would be sound. The contrary has been proved in both cases, in the Society's garden. The universality of the disease

may be inferred from its prevailing in widely distant countries at the same time. Great Britain, Canada, St. Helena may be instanced. It must be concluded that a disease so universal must proceed from some universal cause. Then it may be asked what the causes are by which vegetation is most universally affected.

Vegetation is universally affected by *Temperature*. But to this the disease cannot be attributed. We have had hot and cold and temperate seasons since the disease visited us; and it has continued through them all. A peculiar sudden chill may have spread over great part of Europe and North America, from their proximity to the frozen regions; but such could never reach across the Line and affect the tropical island climate of St. Helena, and the vegetation of the potato there.

Vegetation is universally dependent on *Moisture*: some plants indeed require but little, yet all must have some. Moisture, as we have seen, develops the latent disease or accelerates its progress, but cannot be said to cause it, else why did it not occur in wetter and in drier seasons than any we have had since 1845? The potato has been diseased where less than twenty inches depth of rain have fallen in a year. Formerly it was not diseased in seasons quite as dry; nor was it formerly diseased, on the contrary, in localities where twice that quantity was not unusual. Therefore the excess or deficiency of moisture has not certainly been the cause of disease.

Vegetation requires the presence of *Air*. This of course it has had. And with regard to the amount of atmospheric pressure, this has not varied throughout these years in any considerable degree. Besides, the potato grows at the level of the sea where the atmospheric pressure averages about 2126 lbs. on every square foot; and it thrives likewise on the table-lands of South America at an elevation of 10,000 feet, where the pressure is 743 lbs. less on every square foot than it is at the level of the sea. Therefore it cannot be affected to any considerable extent by minute differences in the density of the air.

There is yet another important and universal agent necessary for healthy vegetation, and that is *Light*. We have had some experience in the use of instruments for estimating the intensity of light; and, in the general sense of the word, it does not appear to have been so defective as to occasion anything like absolute disease. The potato, it is well known, has frequently elongated its shoots several feet or yards in a dark recess, succulent and blanched, it is true, till they have reached the light; but on doing so, green foliage was produced, and no constitutional disease was engendered. In very shaded situations, potatoes produced weaker, paler, and altogether more imperfect plants and tubers than in situations where they were well ex-

posed to light: but in this there was nothing unaccountable—nothing but what any observer of vegetation would have expected under the circumstances; there was no decided disease. Grown in fuller light, potatoes have of late, however, been diseased; and yet it is not to be inferred that light has not influenced the disease. Apparently, the solar light may not be deficient, but it may be defective in some of its usual properties as regards its action on vegetation. It exerts a chemical action on the four organic elements, namely, oxygen, carbon, hydrogen, and nitrogen. The grand result of its action is the decomposition of carbonic acid in the leaves, and consequent fixation of the carbon, which being assimilated, constitutes the principal portion of the solid parts of plants.

It is generally supposed that the decomposition of carbonic acid is directly effected by the action of light on the leaves of plants, but Dr. Draper states in an article in the *Philosophical Magazine* for September, 1843, that "there are many facts which go to prove that the decomposition of carbonic acid is a secondary result, brought about by the action of a nitrogenized ferment in a state of eremacausis, the sunlight operating in the first instance upon the ferment itself." Dr. Draper has satisfactorily ascertained that both oxygen and nitrogen are evolved in the process, and that the volume of mixed gases, namely, oxygen and nitrogen, is precisely equal to the volume of carbonic acid decomposed: but the relative proportions of the oxygen and nitrogen are variable.

The potato contains a greater quantity of easily separable pure starch than is, perhaps, to be found in any other vegetable. Starch is readily changed into other substances under certain influences. It is decomposed by fermentation; the latter is induced by nitrogenized substances. Liebig, if I am not mistaken, has stated that diseased potatoes contain an excess of nitrogen. This may be owing to some change which has taken place in the action of the sun's rays, and the potato plant may have been the most liable to be thereby affected, from its great abundance of starch intermixed with comparatively little of other substances.

Sir John Herschel found, in 1840, that the action of solar light was exceedingly various, both as regards its total intensity and the distribution of the active rays over the spectrum.

It is well known that a ray of solar light, or what is termed a ray, is actually compounded of several rays of different colours—red, orange, yellow, green, blue, indigo, and violet. These rays are found by persons engaged in photographic processes to exert influences not only different in degree of intensity, but even totally negative or antagonistic. Dr. Draper, however, cor-

roborates Sir John Herschel's statement regarding the variableness of their respective effects: alluding to the negative effects produced by the violet rays, he states (*Philosophical Magazine*, vol. xxx. p. 90), "To my surprise I soon found that the negative effect was gradually disappearing, and on September 29 it could no longer be traced, except at the highest part corresponding to the yellow and green rays. In December it had become still more imperfect; but on the 19th of the following March the red and orange rays had recovered their original protective power." He adds, "Are there then periodic changes in the nature of the sun's light?" That this is the case seems highly probable, from the vast changes which must take place in the body of the sun or at his surface to produce those spots which have of late been so conspicuous as to be seen in some instances with the naked eye. In Sir John Herschel's *Results of Astronomical Observations made at the Cape*, he mentions, as instances of their enormous magnitude, that one "occupied an area of nearly five square minutes; and as a square minute on the sun corresponds to 756,000,000 square miles, we have here an area of 3,780,000,000 square miles included in one vast region of disturbance, and this requires to be increased for foreshortening." He mentions another which "would have allowed the globe of the earth to drop through it, leaving 1000 miles clear of contact on all sides of that tremendous gulf."

In the present year, Mr. Pringle, of Edinburgh, gives an account of one of which, on the 21st of September, the diameter was estimated at 60.000 miles. It would, therefore, occupy a space more than fifty times the size which the earth would require to drop through. The shadows of some of these spots have been projected, and it has been found that the shaded parts have been considerably defective in heat compared with the parts illuminated by the unobscured portions of the sun's disc. These spots, it appears, interfere with the heating rays; and from the foregoing statements it is highly probable that the derangements which have been observed to take place in the chemical action of the prismatic rays are owing to the same cause. In one instance Dr. Draper found the action of the red ray inverted. May not similar inversions have been sufficient to prevent the exhibition of the usual green colour observed since the commencement of the disease in the young tips of the potato stems, indicating an imperfect action of the light, and consequent imperfect assimilation of the organic elements, diseased tissue and secretions being the result? Whether those qualified to investigate this view of the subject will find these conjectures correct or not remains to be seen. At all events, except in the great source of light, I can find no cause sufficiently universal to correspond with the universality of the potato disease.

	SORT.	Length of Row in Feet.	Weight of Tubers Sound.		Weight of Tubers Diseased.		Calculated rate of Produce per Acre.					
							Sound.			Diseased.		
			lbs.	oz.	lbs.	oz.	Tons.	cwt.	lbs.	Tons.	cwt.	lbs.
1	Canada Pine	44	8	4	31	4	1	9	19	5	10	55
2	Burgess's Prolific	102	19	4	37	4	1	9	28	2	16	91
3	Cruckshank's Early	123	10	12	60	0	0	13	66	3	15	99
4	Queen of Great Britain	68	14	0	41	2	1	12	3	4	14	41
5	Thurstone's Conqueror	34	34	8	22	6	7	17	96	5	2	43
6	Average of the above	..	..		..		2	12	42	4	7	90
7	Early Manly	82	14	11	58	0	1	7	96	5	10	4
8	Jackson's Improved Ash-leaved Kidney	46	17	2	5	2	2	17	102	0	17	37
9	Cornish Kidney	59	26	11	38	0	3	10	41	5	0	21
10	Seven Weeks' Kidney	29	7	8	2	8	2	0	26	6	14	12
11	Ash-leaved Kidney	92	17	12	11	0	1	10	1	0	18	67
12	Do. or Marjolin	92	24	4	4	0	2	1	0	0	6	85
13	Average of the above	..	..		..		2	4	63	3	4	54
14	Jersey Blue	175	8	0	127	8	0	7	12	5	13	38
15	,, treated according to Meÿer's system	35	12	15	16	4	2	17	57	3	12	15
16	,,	35	2	4	28	6	0	10	0	6	6	14
17	Waller's Kidney	35	1	15	7	10	0	8	68	1	13	99
18	Potato from Norway	105	32	0	36	2	2	7	44	2	13	58
19	Dutch	70	15	6	12	8	1	14	19	1	7	87

20	Burgess's No. 1.	20	1	12	5	6	0	15	7	2	1	90
21	,, 2.	20	6	5	9	4	2	10	62	3	11	106
22	,, 3.	20	1	1	6	12	0	8	29	2	12	56
23	,, 4.	20	0	13	0	11	0	6	35	0	5	39
24	,, 5.	20	3	6	2	1	1	6	28	1	5	107
25	,, 6.	20	2	5	4	4	0	17	110	1	13	5
26	,, 7.	20	1	2	3	12	0	8	84	1	9	19
27	,, 8.	20	1	12	2	8	0	13	68	0	19	50
28	,, 9.	20	4	2	8	10	1	12	9	3	7	10
29	,, 11.	20	1	15	7	13	0	15	37	2	17	68
30	,, 12.	20	1	6	5	0	0	10	77	1	18	100
31	,, 13.	20	1	9	2	11	0	12	17	1	0	100
32	,, 16.	20	1	0	5	8	0	7	87	2	2	87
33	,, 18.	20	1	15	6	1	0	15	8	2	7	17
34	Half-early Pink-eyed Kidney	20	3	9	3	13	1	7	79	1	8	85
35	Round, from the north of Finland	30	10	2	22	8	2	13	17	5	18	14
36	Irish Cup	46	17	6	25	4	2	18	84	4	5	44
	Planted in hills occupying 16 square feet each.											
37	Hardy's Long Red Seedling Kidney, Hill No. 1.	..	1	10	5	6	1	19	56	6	10	73
38	,, ,, 2.	..	0	0	4	12	0	0	0	5	15	51
39	,, ,, 3.	..	5	0	3	1	6	1	70	3	14	49
40	,, ,, 4.	..	3	7	3	3	4	3	62	3	17	53
41	,, ,, 5.	..	0	0	5	15	0	0	0	7	4	37
42	,, ,, 6.	..	4	8	6	1	5	9	43	7	7	41
43	,, ,, 7.	..	6	8	2	8	7	18	0	3	0	86
44	,, ,, 8.	..	8	12	2	6	10	12	77	2	17	81
45	Average of the above	..	..		..		4	10	66	5	1	3

	SORT.		Length of Row in Feet.	Weight of Tubers Sound.		Weight of Tubers Diseased.		Calculated rate of Produce per Acre.					
								Sound.			Diseased.		
				lbs.	oz.	lbs.	oz.	Tons.	cwt.	lbs.	Tons.	cwt.	lbs.
46	Hardy's White Kidney . .	Hill No. 9.	..	2	4	1	12	2	14	77	2	2	60
47	" "	10.	..	1	15	1	12	2	7	11	2	2	60
48	" "	11.	..	2	6	1	14	1	19	97	2	5	64
49	" "	12.	..	2	2	1	14	2	11	73	2	5	64
50	" "	13.	..	2	1	2	5	2	10	15	2	16	22
51	" "	14.	..	1	8	2	5	1	16	51	2	16	22
52	" "	15.	..	1	9	2	15	1	17	109	3	11	44
53	" "	16.	..	2	4	2	14	2	14	78	3	9	99
54	Average of the above . . .		..	..		..		2	6	64	2	13	82
55	Hardy's Long Red Kidney .	(Topped)	32	20	0	8	15	4	17	26	2	3	50
56	" "	(Not topped)	32	24	7	6	1	5	18	90	1	9	53
57	" "	(Topped)	32	22	2	8	12	5	7	63	2	2	60
58	" "	(Not topped)	32	15	13	7	2	3	16	98	1	14	71
59	Maclean's "*Vast-tater*" .	(Topped)	32	13	10	1	3	3	6	16	0	5	106
60	" "	(Not topped)	32	11	3	0	15	2	14	43	0	4	62
61	" "	(Topped)	32	6	14	23	2	1	3	47	5	12	47
62	" "	(Not topped)	32	8	5	30	8	2	0	46	7	8	31
63	Average produce of the above 4 rows,	topped	..	..		..		3	13	66	2	10	108
64	" "	not topped	..	..		..		3	12	69	2	14	26
65	Difference in favour of topping . .		..	..		..		0	0	109			

	Experiment, tried August 9th, in pulling up the Haulm, and rolling every alternate half row.													
66	Hardy's White Kidney . .	(Not rolled)	16	9	3	3	0	4	9	37	1	9	19
67	" "	(Rolled)	16	6	8	0	8	3	3	12	0	4	96
68	" "	(Not rolled)	16	10	11	2	1	5	3	102	1	0	6
69	" "	(Rolled)	16	9	14	1	5	4	16	1	0	12	85
70	" "	(Not rolled)	16	8	10	0	10	4	3	96	0	6	8
71	" "	(Rolled)	16	8	11	1	3	4	4	52	0	11	61
72	Hardy's Round Seedling .	(Not rolled)	16	10	1	0	14	4	17	94	0	8	56
73	" "	(Rolled)	16	7	13	0	12	3	15	107	0	7	32
74	" "	(Not rolled)	16	10	4	1	11	4	19	74	0	16	45
75	" "	(Rolled)	16	9	9	0	15	4	12	109	0	9	13
76	" "	(Not rolled)	16	9	13	1	7	4	15	45	0	13	109
77	" "	(Rolled)	16	7	11	1	2	3	8	7	0	10	105
78	" "	(Not rolled)	16	6	3	1	12	2	18	38	0	17	1
79	" "	(Rolled)	16	7	1	1	5	3	8	75	0	12	85
80	" "	(Not rolled)	16	6	1	1	4	2	16	62	0	12	17
81	" "	(Rolled)	16	8	4	0	9	4	0	24	0	5	52
82	Hardy's White Kidney . .	(Not rolled)	16	7	15	1	1	3	17	20	0	10	37
83	" "	(Rolled)	16	6	14	0	8	3	6	94	0	4	96
84	" "	(Not rolled)	16	8	6	0	4	4	1	48	0	2	48
85	" "	(Rolled)	16	6	9	3	4	3	3	90	1	11	67
86	" "	(Not rolled)	16	6	1	1	8	2	18	106	0	14	65
87	" "	(Rolled)	16	8	5	0	15	4	0	92	0	9	13
88	" "	(Not rolled)	16	9	7	1	3	4	11	85	0	11	61
89	" "	(Rolled)	16	4	5	1	7	2	1	104	0	13	109
90	" "	(Not rolled)	16	9	7	1	11	4	11	85	0	16	45
91	" "	(Rolled)	16	7	2	0	2	3	9	31	0	1	24
92	" "	(Not rolled)	16	7	12	0	15	3	15	39	0	9	13

	SORT.		Length of Row in Feet.	Weight of Tubers Sound.		Weight of Tubers Diseased.		Calculated rate of Produce per Acre. Sound.			Diseased.		
				lbs.	oz.	lbs.	oz.	Tons.	cwt.	lbs.	Tons.	cwt.	lbs.
93	Hardy's White Kidney . .	(Rolled)	16	8	3	1	5	3	19	68	0	12	85
94	,, ,,	(Not rolled)	16	6	12	2	1	3	5	70	1	0	6
95	,, ,,	(Rolled)	16	8	5	1	1	4	0	92	0	10	37
96	,, ,,	(Not rolled)	16	5	11	1	6	2	6	41	0	13	41
97	,, ,,	(Rolled)	16	6	13	0	6	3	6	26	0	3	72
98	,, ,,	(Not rolled)	16	4	14	1	4	2	7	44	0	13	41
99	,, ,,	(Rolled)	16	6	1	0	13	2	18	106	0	7	100
100	,, ,,	(Not rolled)	16	6	5	0	0	3	1	42	0	0	0
101	,, ,,	(Rolled)	16	5	15	1	15	2	8	90	0	18	94
102	Average of the above 18 half rows,	not rolled	..	..		..		3	16	87	0	13	3
103	,, ,,	rolled	..	..		..		3	11	53	0	5	60
	Experiment of dusting the Leaves and Stems with Sulphur, September 2nd.												
104	Hardy's Long Red Seedling Kidney	(Sulphured)	112	55	0	63	8	3	16	44	4	8	22
105	,, ,,	(Not sulph.)	112	73	0	47	12	5	1	44	3	5	31

XIII.—*Notes on Fruit and Kitchen Plants proved in the Garden of the Society in* 1848. By R. Thompson.

1. The Queen Muscat Grape.

A plant of a vine under the above name was received last spring from Mr. Glendinning, Chiswick Nursery, Turnham Green. It was only a young plant raised from an eye in the previous season. It however fruited in an 8-inch pot. The size the bunch would attain from a well-established vine can therefore only be estimated comparatively with that of other sorts grown in a pot under similar circumstances, and accordingly it may be stated to be larger than that of the Royal Muscadine. The berries are also fully as large as those of the latter, but perfectly distinct, being oval. They are yellowish white, semi-transparent, so that the one seed which each berry contains can be seen through the skin. The flesh is firmer than that of the Sweetwater, but much more tender than that of the Muscat of Alexandria, rich and sugary. It is an early grape; and as far as can be judged of it, grown as above stated, it appears highly deserving of cultivation. For pot culture it has proved to be exceedingly well adapted.

2. Cardon Puvis.

This is a variety of cardoon remarkable for its almost entire and spineless leaves. In this season there were some sharp frosts in November, the temperature being sometimes 10°, and in one instance 14° below the freezing-point. It appeared from these circumstances that the Cardon Puvis was more tender than the Cardon de Tours.

3. Largest Asiatic Cauliflower.

This is a good variety of cauliflower, seeds of which were this year, and formerly, received from Messrs. Schertzer, of Haarlem. It grows taller, and produces larger heads, than the common, under the same circumstances.

4. Early Leyden Cauliflower.

Also received from Messrs. Schertzer, of Haarlem. This appeared identical with Legge's Walcheren Brocoli or Cauliflower, noticed vol. i. p. 309. To this notice, and particularly to the excellent directions by the late Mr. Legge for the cultivation of the variety, I would beg to direct attention. A correction is required, page 310, line 6 from the top:—"For the purpose of *sowing* seed," read *saving* seed. It is difficult in very many cases to save brocoli-seed correctly in this country, and to save it in any degree of perfection is often impossible. It is therefore satisfactory to know that this most useful variety, sometimes difficult to obtain under the name of Legge's Walcheren Brocoli or Cauliflower, may be procured, under the name of the Early Leyden Cauliflower, from the Continent.

5. Black Sicilian Cauliflower.

This, received from Messrs. Schertzer, of Haarlem, proved to be the Purple Cape Brocoli.

6. Haricot d'Espagne Hybride.

This is a hybrid variety of scarlet runner, presented to the Society by Messrs. Vilmorin, of Paris. The blossoms are very beautiful—bright scarlet and pure white. The pods did not remain quite so long fit for use as those of the old scarlet runner. It however deserves cultivation.

7. Shilling's New French Bean.

This seems a cross between the French bean and scarlet runner. The pods are large, and remain long tender.

8. Dwarf Crimson-seeded Bean.

Fève très-naine rouge. Presented to the Society by Messrs. Vilmorin, of Paris. This proves to be a very dwarf prolific variety of broad bean. It does not exceed a foot in height. The pods are about three inches in length, roundish, generally well filled. The seeds are crimson, nearly the size of those of the Long-pod Bean. It is so very dwarf that it could be grown in rows 12 to 15 inches apart. It might be very conveniently introduced in systems of intermediate cropping, as it would occasion but little shade. Its amount of produce, compared with that of taller kinds, has not been ascertained; but this point will be determined the first opportunity.

9. Onions.

On examining the varieties of those grown this season, it was ascertained that the French Red, and also the Blood-red Spanish, from Schertzer, of Haarlem, are the same as the Oignon Rouge Noir from Vilmorin, and are the Blood Onion well saved. The Yellow Spanish from Schertzer is the same as the Oignon d'Espagne from Vilmorin. The French White from Schertzer is of the colour of the Silver-skinned; but it is later, and it has the fault of being too thick at the neck.

10. The Large Rouen Leek.

Poireau très-gros de Rouen. Presented by M. Vilmorin, of Paris. This was grown alongside the London Flag and the Netherlands Leek; and under the same circumstances it proved larger and of a darker green than either. It can therefore be highly recommended for cultivation.

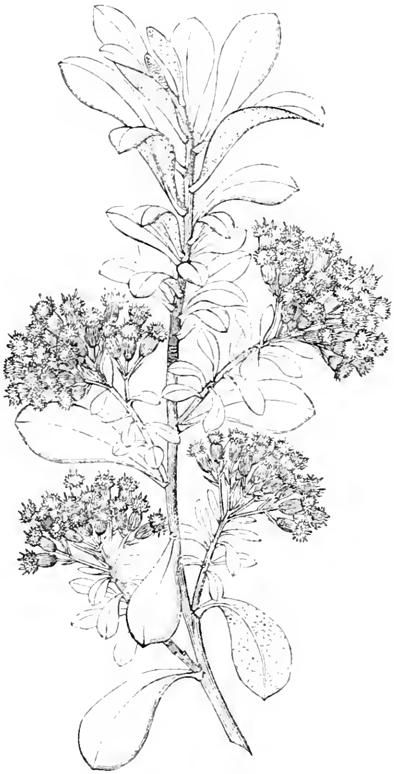
11. Barrott's New Crimson Beet.

Presented by Mr. Glendinning. This proves to be an excellent variety. It is less apt to fork than the Castelnaudary, from which it has probably been raised. Like those of the latter, its leaf-stalks have a yellow tinge. It is somewhat larger than the Castelnaudary. Flesh very dark crimson. The best variety known.

NEW PLANTS, ETC., FROM THE SOCIETY'S GARDEN.

1. Swammerdamia antennaria. *De Candolle, Prodromus*, vol. vi. p. 164.

This is a small compact evergreen bush, not at present more than 3 feet high. It has angular viscid shoots, and a foliage the colour of Euonymus japonicus. The leaves are at the largest not more than an inch long, and generally smaller, obovate, apiculate, or perfectly blunt, veinless, concave, with a little mealiness on the under side when young. The flower-heads are small, white, and collected in little lateral corymbose panicles.



It is found wild in Van Diemen's Land, on the sides of Mount Wellington, where it flowers in the months of January, February, and March. The late Professor De Candolle gave it its name, in allusion to the form of the pappus, which he thought resembled the antennæ of an insect, a very obscure peculiarity.

A hardy evergreen small shrub, growing freely in any common garden soil, and easily increased by cuttings in the usual way. Its clusters of small flowers add little to its beauty, which is confined to the foliage.

June 17, 1848.

2. Limnanthes rosea.* *Bentham.*

Raised from seeds brought home by Mr. Hartweg in 1848, and said to be found in swampy places in the Sacramento Valley, California.

A prostrate succulent plant, with all the habit of Limnanthes

* L. *rosea*, Bentham; foliis linearibus pinnatis bipinnatis integrisque laciniis filiformibus, indivisis, pedunculis foliis multò longioribus, petalis basi barbatis, fructu corrugato.—J. L.

Douglasii. The leaves are extremely narrow, and sometimes have no side lobes; in other cases they are pinnate or even somewhat bipinnate. The flowers are a pale dirty rose colour, and stand on stalks much longer than the leaves. Each petal has its base bordered with long hairs.

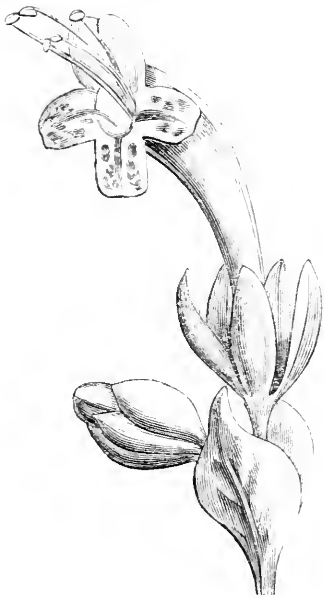
It is a hardy annual, and requires the same treatment as Collinsias and Nemophila insignis. If sown in the autumn, it flowers in May; if sown in the spring, it flowers during the summer.

It is tolerably pretty, but of less interest than L. Douglasii. The collector who found it called it L. pulchella, a name which is only calculated to mislead.

Oct. 16, 1848.

3. Æschynanthus Paxtoni.*

Received from Messrs. Henderson, of the Wellington Nursery, St. John's-wood Road.



* Æ. *Paxtoni;* foliis coriaceis oblongo-lanceolatis acuminatis petiolatis convexis subtus punctatis, bracteis membranaceis oblongis subrhombeis concavis pedicellis longioribus, sepalis 5 oblongis obtusissimis, corollæ limbo plano labio superiore emarginato lateralibusque truncatis.—J. L.

This plant, which bears in gardens the name of Æschynanthus Paxtoni, does not appear to have been described. It has large convex dark green even leaves, which are slightly marked on the under side with impressed dots. The bracts are of unusual size, thin, pale green, slightly stained with red. The sepals are remarkably large and broad, and are divided to the very base. The flowers are dull red, with a flat limb, divided into four nearly equal lobes, which are square at the end, as if they had been cut off. It seems to be most nearly allied to Æsch. ramosissimus and Griffithii.

A trailing half-shrubby stove plant, growing freely in any light mixture, such as leaf-mould and broken crocks, with plenty of drainage. It also may be grown fastened to a rough block of wood, and surrounded with moss. It requires a moist atmosphere while in a growing state; but afterwards should be kept nearly dry. It is easily increased by cuttings.

It is a showy kind, but not so handsome as the smaller species.

Oct. 16, 1848.

4. Polygonum vacciniifolium. *Wallich, Plantæ Asiaticæ Rariores*, iii. 54; *Royle's Illustrations*, t. 80, f. 2.

Raised from seeds received, in April, 1845, from Captain William Munro, from the northern parts of India.

A trailing plant, with permanent half-shrubby stems. The leaves are oblong, mucronulate, dark-green, glaucous on the under side, and furnished with sheathing stipules, bordered with very long bristles. The branches which bear the flowers rise from the ground to the height of 3 or 4 inches, and are each furnished with from 2 to 4 narrow spikes of deep rose-coloured flowers.

Dr. Royle states that this grows on the Himalayas to the height of from 7000 to 13,000 feet, which accounts for its being perfectly hardy in England.

It is an extremely pretty species, trailing, growing freely in any good well-drained loamy soil, and easily increased by cuttings. Its flowers are a great decoration during autumn to rock-work, among which its roots strike to a considerable depth. They continue to retain their gay colours till the frost changes them to a warm brown.

Sept. 7, 1847.

5. Cyclobothra monophylla.*

Brought home by Mr. Hartweg in June, 1848, and said to have been collected upon the Sacramento Mountains, where it is very scarce.

A bulbous plant, with a long coarse membranous neck, extending 3 or 4 inches under ground. Stem 3 or 4 inches high, slender, bearing a single linear-lanceolate leaf, glaucous on the under side, and about three times its own length. The flowers are from two to three in a corymb, with curved peduncles, longer than the very narrow bracts; they are smaller than is usual in the genus, and of a uniform bright yellow. The sepals are ovate, and very sharp pointed; the petals are of a similar figure, but not so acute, and are covered with coarse hairs.

It is a hardy little bulb, which requires the same kind of treatment as Calochortuses. It should be grown in a light soil, composed of sandy peat, loam, and leaf-mould, with plenty of sand. It is increased by offsets from the old bulb. The proper place for it is an American border, where it should be left undisturbed. *Sept.* 10, 1848.

6. Abronia umbellata. *Lamarck, Illustrations*, i. 469, t. 105.

Raised from seeds, received from Mr. Hartweg in January, 1848, and said to have been collected on the sands near the sea-shore, Monterey, California.

This plant, like the rest of the genus, grows naturally in

* C. *monophylla;* folio solitario lineari sublanceolato acuminato subtus glaucescenti scapo subtrifloro ebulbi triplo longiore, pedunculis bracteâ lineari acuminatâ longioribus, sepalis acutis calvis petalisque undique barbatis apice recurvis.—J. L.

loose sand, the particles of which adhere to its glutinous surface. In such places it creeps along the ground, producing long rooting stems, and ovate obtuse succulent leaves, fringed with soft hairs, which almost disappear in dried specimens. The flowers are formed in close umbels, and consist of a long violet tube, with a five-cleft flat limb, the lobes of which are regularly 2-parted. It has much the habit of a Verbena, but the flowers are agreeably sweet-scented.

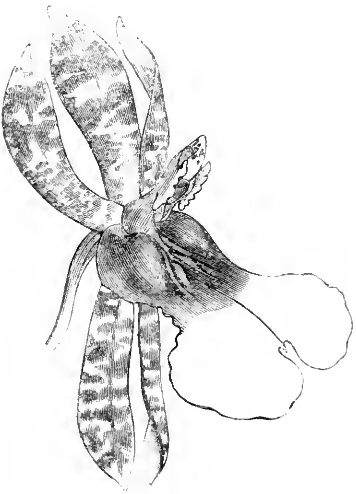
It is probably not quite hardy, but it succeeds well under the same treatment as that given to the different kinds of Verbena. It is easily increased either by seeds or cuttings, and is very suitable for placing in the open border, treated as an annual. It requires a light rich soil to grow in, and flowers from June to October.

It must be regarded as a very desirable plant for growing in pots and beds The flowers are exceedingly fragrant, especially in the evenings.

Nov. 16, 1848.

7. MILTONIA KARWINSKII. Cyrtochilum Karwinskii. *Bot. Register, sub t.* 1992; Oncidium Karwinskii, *Sertum Orchidaceum, sub t.* 25.

Received from Mr. Hartweg, and supposed to have been collected at Oaxaca, in 1839.



This beautiful plant was originally described from a small dried specimen brought from Mexico by Count Karwinski, and was then referred successively to the genera Cyrtochilum and Oncidium; it is, however, a true Miltonia, and one of the finest plants in cultivation. Imagine a rod 3 feet long, stiff, and nearly upright, being covered for three parts of its length, at intervals of an inch and a half, with large gay white, purple, yellow, and brown flowers, fully $2\frac{1}{2}$ inches in diameter, and an idea will be formed of this charming species. The sepals and petals are bright yellow, barred and spotted with brown; the lip is white at the point, deep violet at the base, and blush in the middle space. The column is nearly white, and adorned by two serrated hatchet-shaped wings.

It requires to be treated like an Oncidium, and to be grown in rather a cool temperature, in pots filled with fibry peat and half-decayed leaves, well drained.

It is one of the most beautiful and distinct Orchids in cultivation.

Aug. 14, 1848.

8. BRODIÆA CALIFORNICA.*

Brought home by Mr. Hartweg in June, 1848, and said to have been collected upon the mountains and plains of the Sacramento, where it is scarce.

This bulb is very like the old B. grandiflora, from which it differs in the following particulars: it is a much larger plant in all respects; its leaves are more fleshy; the flowers, which are pale blue, with darker streaks along the middle of the divisions, have a tube which is slightly inflated, and much shorter than the limb; the flower stalks are also much longer in proportion to the flowers.

It is hardy, and requires a strong sandy loam, with the same kind of treatment as Scillas. It is easily increased by offsets from the old bulbs. The species is rather pretty, and flowers freely from July to October, or even Christmas, if sheltered by a frame.

Dec. 6, 1848.

* B. *californica*: perianthii limbo tubo subventricoso longiore, foliis carnosis canaliculatis scapi longitudine.—J. L.

ORIGINAL COMMUNICATIONS.

XIV.—*Remarks on Artificial Climate.* By A. Scott, C.M.H.S., Gardener to Sir Geo. Staunton, Bart., M.P., F.H.S., Leigh Park, Havant, Hants.

(Communicated January 29, 1849.)

In cultivating plants from warm latitudes, in this country, it is obvious that our success will mainly depend upon the skilful management of our artificial climate; this renders the latter a subject of importance to all interested in the higher branches of horticulture. If I have nothing new to offer in the following remarks, they may at least be relied on as the result of some experience.

To be successful in this department of gardening, to our knowledge of cultivation we ought to add a more or less intimate acquaintance with the laws which govern the diffusion of heat, light, and vapour, together with their influences on vegetation; inasmuch as all varieties of climate mainly result from the amount and relative proportions of these agents. But in order to maintain suitable climates for the various wants of all our in-door plants, it is not necessary that we should attempt to imitate all the warm climates of the world; for it has been proved by experience that an exact imitation of every peculiarity that affects plants in their native country is far from being necessary to their well-being under glass: nearly all of them will thrive in an atmosphere differing considerably from that which they experience in a state of nature, in respect to both temperature and humidity. This is a rule to which I know of no important exceptions; even the Mangosteen, which refuses to thrive on the continent of India, or indeed anywhere but in the heated and moist atmosphere of the Indian Archipelago, succeeds in our artificial climate; plants of it in this garden have grown, in little more than three years, 10 feet in height, bushy, and branchy in proportion. Although we never expect to alter the nature of plants by artificial treatment, yet with a little management they submit to the latter with docility. In warm countries plants usually experience a considerable variation between the day and night temperatures, independently of the difference between the wet and dry seasons: when occasion requires it, therefore, as during our winters, we find it a point of great importance to regulate humidity so that we may safely adopt a minimum temperature considerably lower than the natural one. At all seasons we shall also be acting correctly in supplying less of both heat and moisture to produce a given result, owing to the altered circumstances respecting the

diffusion of both. To supply an equal amount of these stimulants in our murky climate would be erroneous in principle and injurious to vegetation. The last remark applies with equal force to night temperatures.

Among the various agents employed in warming horticultural buildings hot water is at present that most generally adopted. Heating by flues answers for certain purposes—as for vineries, greenhouses, &c. The Polmaise plan, which in particular cases I have found to be simple and efficient, is by far the most inexpensive to erect; but under present arrangements it is difficult to apply it successfully to large houses. Price's ingenious plan of heating, although it does not differ materially from other methods of warming by hot water, in causing the air to carry the heat into the building, has in some degree anticipated part of the Polmaise plan: I, however, find this method very expensive with regard to fuel.

In the choice of boilers I imagine that we are often more nice than wise. The saddle-shaped boiler of wrought iron, and the cast iron boilers of various sizes, called Healy's, Cottam's, Rogers', &c., have been tried here, and from experience I find that the setting is of far more consequence than shape. Mr. Ainger, in the 'Gardener's Chronicle' for 1841, clearly explained the principles of setting boilers for horticultural purposes; and Messrs. Burbidge and Healy have subsequently adopted his plan, with improvements. Their boiler I consider to be the best.

Another important matter in warming is that the pipes shall be so arranged as to give out heat rapidly. The amount of pipe required, and the expense of heating any building, will very much depend upon how far this is attended to. In some cases nearly the whole of the heating surface is buried in underground channels or drains, sufficient heat being expected to rise through a few openings in the pathway. It is clear that if the required amount can be obtained at all under such conditions, it must be at an enormous first cost, and an extravagant waste of fuel. The question arises, why should a thing so essential to a horticultural building be concealed as unsightly? If the usual form of hot water pipe is not ornamental it can be improved, and the pipes may be so arranged as not to offend the eye of taste.

Mr. Hood, in his valuable work on Warming Buildings by Hot Water, gives a rule, and also a table, whereby we may ascertain the required amount of pipe to heat a hothouse of given dimensions any number of degrees; and states that the quantities found will be sufficient for a given superficies of glass, whatever the size of the building may be. His rule may be safely relied on; although in this, as in other things, I find, as might be expected, that differences occasionally occur between theory and practice;

for the former does not pretend to anticipate all the circumstances accompanying the latter. The following statement may likewise be of service in estimating the heating-surface required for different sizes of horticultural buildings. In stoves of considerable dimensions containing from 50,000 to 60,000 cubic feet of air, having a surface of glass (including rafters and sash-bars) in the proportion of 1 square foot of glass to 10 cubic feet of air, the proportion of 1 foot of 4-inch pipe to 5·33 feet of glass will be ample heating-surface to maintain a minimum temperature of 60° during severe weather. But in a house containing from 10,000 to 15,000 cubic feet of air, with a superficies of glass, &c., in the proportion of 1 foot of glass to 6·75 feet of air, the proportion of 1 foot of pipe to 3 feet of glass will be required to maintain a minimum temperature of 60° or 65°, provided covering be not used. In vineries and peach-houses the quantity of heating-surface required will very much depend on circumstances —as whether they are detached or connected in a range; also whether the crop is wanted early or late: but 1 foot of pipe to 4 feet of glass will be a fair average for vineries, and 1 foot of pipe to 5 feet of glass for peach-houses. Conservatories and green-houses, according to size and other circumstances, will require 1 foot of 4-inch pipe to 5 or 6 feet of glass. If flues are preferred, I should consider 1 foot of an ordinary flue equal to 2 feet of 4-inch pipe. In pits or small forcing-houses, where covering can be easily applied at night, the proportion of 1 foot of pipe to 4·5 feet of glass will maintain a minimum temperature of 60°.

Our fears of not being able to maintain sufficient heat and moisture during winter often lead to errors of an opposite kind; for in the comparatively still atmosphere of a hot-house one of the most powerful natural agents, both in drying and cooling, is almost wholly excluded. It is probable that the rate of evaporation during very strong wind is nearly double that in a hot-house. In this country we seldom experience much inconvenience from the drying effects of the weather during spring or summer, unless accompanied by wind. I believe that very incorrect ideas are often entertained concerning the drying effects of our heating apparatus. In a house heated by hot-water pipes, the moisture of the air is not affected thereby; the loss by condensation on the glass in cold weather is, however, very considerable, and is in direct proportion to the difference of temperature between the internal and external air; or, in other words, to the loss of heat by radiation from the glass. The greatest degree of dryness will perhaps occur when a night of severe frost is succeeded by bright sunshine in the early part of the day; but notwithstanding this, if the glazing be complete, there will be no difficulty in supply-

ing this loss by ordinary means, without adopting the unnatural method of raising vapour by the direct action of the hot-pipe either at a low or comparatively high temperature. The inevitable loss of moisture by condensation should be supplied by natural evaporation from paths, and other available surfaces; but to meet the extra and more temporary demand occasioned by bright sunshine in frosty weather, an immediate supply may readily be obtained from the hot-pipes; although, as is very apparent, this last method is too artificial to be relied on for a regular and genial supply of humidity. If ordinary care be taken to keep the paths, &c., moist, it will be found that no very injurious degree of dryness is produced even in maintaining a minimum temperature of 60° or 65° during frosty weather. In large houses there will be less inconvenience felt from the loss of moisture by condensation than in small ones; and as prevention is better than cure, small houses, or pits, should always be covered with mats, or other suitable materials, thus preventing loss of heat by radiation from the exterior surface, and consequently loss of moisture by condensation on the interior surface of the glass. The pine, and other forcing pits, and also the smallest plant-stove here, which is span-roofed, 23 feet in height, and 25 feet in width, are covered every night during winter, by which a healthier atmosphere is not only preserved, but a great saving is effected both in fuel and labour, and the cost of covering materials is amply repaid.

Although, under the most careful management, this practice must necessarily occasion some little loss of light, yet the loss is but a trifling inconvenience compared with that of leaving small houses uncovered during severe weather, for, as I have already shown, it is difficult to regulate climate in the latter description of buildings. Many plants are but little affected by considerable variations in the degree of humidity; but in all unusual or difficult cases of cultivation, and also in early forcing, during the flowering and ripening periods, culture of orchids, &c., more nicety will be required in regulating moisture, and great variations in the amount of humidity will occasionally be required to suit particular cases. Whenever any doubt exists on this subject, Daniell's hygrometer should be used to ascertain not only the real amount of vapour in the air, but also to test the efficiency of our means of supplying any defect. I find no difficulty whatever in taking observations with this hygrometer at any time, even by candlelight. When once the required degree is ascertained, there will seldom be further need of consulting this elegant, but somewhat delicate instrument, as two thermometers, one with the bulb wet and the other dry, will give a tolerably correct idea of the rate of evaporation, and indicate

with sufficient accuracy the dew point according to Daniell. The air at the limits of congelation holds about $\frac{1}{160}$th part of its weight of aqueous vapour, and every increase of temperature equal to 20° of Fahrenheit will double its capacity for abstracting moisture. As the difference between the night and day temperatures will frequently exceed this, the necessity of providing against an injurious degree of dryness is apparent. In our summer months, during very hot weather, judicious shading may be a less evil than the excessive dryness which it is chiefly intended to prevent.

Ventilation, in hot-houses, is required to serve a double purpose: to renew the atmosphere, or exchange a portion of the external for the internal air, and thus to give a gentle motion or current amongst the plants; if this be done judiciously, it may be practised at all times or seasons with but little waste of fuel. Motion, and consequently change, exist in every natural climate, and cannot be entirely withheld from plants in hot-houses without a corresponding loss of vigour and compact growth. The other purpose of ventilation is to prevent an injurious increase of temperature during hot weather, or sudden bursts of sunshine.

Although the principles of ventilation are simple enough to be understood by all gardeners, I may mention that there should always be one set of ventilators, or sliding sashes, at the top or upper part of the house, and another near the floor where the newly admitted air may, by passing over a part of the heating surface, have its temperature gradually raised to that of the house. By giving more air by the lower than by the upper ventilators, it will be gradually discharged at the top of the house with but little cold draft among the plants. If the upper ventilators only are opened, we shall experience counter currents and drafts of cold air. The lowest may be sliding ventilators in the brickwork, and they should be comparatively numerous in order that small quantities may be admitted by each, thus preventing sudden gusts of cold air at one place. Our stoves being span-roofed, with pediment-like ends, in the very apex or upper angle is a sliding sash, which proves to be an excellent ventilator at all times, but particularly during the winter months, allowing the air to escape in quantities as small as need ever be required in practice. Various contrivances will suggest themselves, according to existing circumstances, for warming and moistening the air before it is admitted among the plants. This is chiefly of importance in plant-stoves and early forcing-houses during severe weather.

It is apparent that all our contrivances for warming and regulating temperature and humidity in confined atmospheres will

have no effect in deteriorating the air, and that its original constitution will remain unchanged. As the most important function of vegetable life is the decomposition of carbonic acid gas, and the assimilation of carbon under solar influence, the source of the latter, and other aliments which plants derive from the air, will be present in the usual proportions. Nevertheless the plants may not be able to assimilate their due proportion of these elements, for the sluggish motion of the air in a hot-house is so different from the natural atmosphere, which is always in motion, more or less rapid, both horizontally and vertically, that the plants may not be able to appropriate their due share of atmospheric food, the air not coming fast enough in contact with the leaves, and other surfaces of absorption. The advantages to vegetation of brisk motion in the air, therefore, will be obvious.

XV.—*Ferns as Decorative Objects.* By Thomas Moore, F.B.S., Curator of the Physic Garden of the Worshipful Society of Apothecaries, Chelsea.

(Communicated March, 1849.)

Within the last few years the taste or fancy for Ferns appears to have been on the increase; and this has latterly become very apparent, as in some degree is evidenced by their appearance in profusion at public exhibitions of plants. It has been thought that a few hints might be thrown out of such a nature as to help forward and more widely extend this class of cultivation, so peculiarly deserving of attention. Without claiming any peculiar fitness for the task, I have ventured to attempt its execution, in the hope of being able to supply some instruction to those who really need it. To those who are already well versed in the art of culture, and to those also who understand Ferns, the hints which follow are not addressed.

Viewed as objects of decoration, Ferns may be conveniently disposed into two principal groups, namely,

I. Those which are suitable for cutting as an addition to bouquets, both large and small.

II. Those in which the entire plant, well cultivated, may be specially employed for purposes of ornament.

The latter of these two groups evidently includes the greater number of the species belonging to the former, and may be composed of individual kinds proper for cultivation in pots or vases, as well as of those which may be managed in a semi-natural way, attached to rocks or the stumps of trees: most of the species being suitable for either of these modes of culture.

I. For hand-bouquets it is obviously the smaller-growing

species, or those that produce fronds which admit of being separated into small, yet natural-looking divisions, that are most suitable. The former are preferable, because the latter in many cases would be deficient of stalk, and this deficiency would be apt to render them not only more difficult of adjustment in bouquets, but also in a greater degree short-lived. Larger bouquets, such as are placed in drawing-rooms, admit of the introduction of somewhat larger growing kinds, provided they possess the necessary and indispensable elegance of contour.

To be practically useful for either of these purposes, the kinds of Ferns selected must be such as are naturally of a rigid or sub-rigid texture, or at least sufficiently firm or fleshy to bear up against the parching influences to which, in the dry atmosphere they would be likely to be placed in, they would be more or less exposed.

Many of the more beautiful species of Ferns are thus wholly excluded from this association, because of the delicacy of their texture, beautiful only whilst confined to the close damp atmosphere which conduced to their development. Exclusive of these, however, there exists a considerable variety, both as to size and form, in every way suited for the purpose of ornament, and some of these will presently be more particularly referred to.

The plan of placing bouquets in vases covered by a close-fitting dome-glass is greatly conducive to the preservation of the flowers. If such a plan were adopted with those bouquets in which Ferns preponderate, the freshness of the latter would be retained for an incredibly long period. Ferns might, in fact, often entirely take the place of flowers, and no more elegant or ornamental group could be devised. In such cases, the close covering would render the Ferns almost permanent, their duration would be so greatly prolonged.

In the lists which follow will be found not only species that are evergreen, but also some which lose their fronds in the winter season. In those plants which have the latter habit the fact is expressly mentioned.

Polypodieæ.

1. *Notholæna* (Lepichosma) *lendigera*.—One of the most elegantly divided of all the smaller Ferns. It is a small growing plant, the fronds growing in tufts, and usually attaining 8 or 10 inches in length, and becoming elaborately divided, in a tri-pinnate manner, into small roundish segments; the entire fronds are somewhat pubescent. This is a native of Central America, and requires a sub-tropical climate. The full-grown, well-matured fronds may be cut for small bouquets; younger ones

would too rapidly wither in a dry atmosphere. A fine pot specimen is very elegant.

2. *Notholæna* (Eriochosma) *hirta.*—A small, hairy species, the fronds of which grow in tufts, and are from 4 to 12 inches long, bipinnate, the pinnules being divided into small blunt lobes; the under surface is clothed with a white tomentum, which becomes less apparent as the fronds grow old. It requires a warm close greenhouse, being a native of the Cape of Good Hope. The mature fronds are suitable for small bouquets.

3. *Notholæna* (Eriochosma) *tomentosa.*—The fronds of this species, which grow in tufts, are narrow lanceolate, a foot or more in length, with short alternate pinnæ, which are bipinnate, the ultimate pinnules being minute, sessile, and roundish. The fronds are entirely and rather thickly covered with light-coloured tomentum. A sub-tropical species, being a native of Mexico. The fronds may be intermixed in large bouquets.

4. *Notholæna nivea.*—A species of a tufted habit of growth. The fronds are but a few inches high, oblong, decompound, the opposite pinnæ being set with small, roundish, sub-cordate pinnules, often somewhat three-lobed. The upper surface is smooth, the under surface covered with a white mealy powder, while the stipes is of a blackish purple. A very neat kind for small bouquets. It is a native of Mexico, and requires a sub-tropical climate.

5. *Polypodium Plumula.*—An elegant small growing species, producing its fronds in a tuft. The fronds are 8 or 10 inches long, of an elliptical form, or rather narrowly lance-shaped, tapering to both ends; they are pinnatifid, divided into close-set narrow lobes, ranged like the teeth of a comb. Useful for moderate-sized bouquets, and a very pretty pot-plant. Native of South America, and requires a tropical climate.

Pterideæ.

6. *Cheilanthes micropteris.*—A small and elegant plant, with fronds 6 or 8 inches long, growing in tufts; they are pinnate, with small, roundish, alternate pinnæ; the stipes is purple. A native of Quito, and requires a stove climate. Pretty for small bouquets.

7. *Cheilanthes spectabilis.*—Suitable for large bouquets; a tuft forms a fine specimen plant. The fronds are broadly ovate-lanceolate, a foot high, tripinnate, the pinnæ and pinnules rather distant, the latter broken up into small oblong sessile lobes. It is from Brazil, and requires a stove climate.

8. *Cheilanthes tenuifolia.*—The habit of this species is tufted, the fronds 8 or 10 inches high, supradecompound, the outline oblong, the pinnæ rather distant, and ultimately divided into

very small segments. Useful for bouquets, and an elegant pot plant. It is a native of the East Indies and of New Holland, and requires a sub-tropical climate.

9. *Cheilanthes microphylla.*—The fronds, though upwards of a foot long, are yet comparatively small, from the smallness of their parts. They are narrowly lanceolate, bipinnate, with short and rather distant and alternate pinnæ, bearing a dozen or more small oblong pinnules. West Indian, and requires to be grown in a stove. This species is best adapted for bouquets, and from its length, will serve better for large than for small ones.

10. *Cheilanthes micromera.*—One of the prettiest of Ferns for a small bouquet, and forming a very elegant potted subject. The fronds grow nearly a foot long; they are twice-pinnate, the small obtusely-oval pinnules having roundish lobes at their bases; the pinnæ are alternate. This is a Mexican species, and requires a sub-tropical climate.

11. *Pteris* (Cassebeera) *farinosa.*—An elegant species both for pots and for bouquets. The fronds grow a foot long, and are of variable outline, sometimes ovate-deltoid, sometimes lanceolate; they are pinnate, with the lower pinnæ deeply pinnatifid, the segments on the inferior side longest. The under surface of the fronds, which grow in tufts, is covered with a white mealy powder. An East Indian species, requiring the temperature of a stove.

12. *Pteris* (Cassebeera) *pedata.*—This species grows in a somewhat rigid tuft, and reaches about a foot in height, the fronds being three-parted, with the lateral divisions again divided, thus forming five lobes, so that in circumscription the fronds are somewhat pentangular; the lobes, or divisions, are deeply pinnatifid. The stipes is two-thirds the entire length of the frond. In large bouquets the fronds may be used advantageously to mix with others of different form and habit. It requires a stove climate, being a native of both Indies.

13. *Pteris* (Cassebeera) *auriculata.*—The habit is tufted, the fronds 8 or 10 inches or more in height, pinnate, with triangular-ovate, somewhat auricled pinnules; the rachis and stipes are purple. Useful for larger bouquets. Requires a warm greenhouse, being a native of the Cape of Good Hope.

14. *Pteris* (Platyloma) *sagittata.*—A remarkably elegant plant. The fronds are tufted, a foot and a half or more in length, regularly bipinnate, the pinnules being distant, glaucous, exactly arrow-shaped (elongate-triangular), and attached by short slender footstalks. It is a South American species, and requires a tropical climate. The fronds are somewhat rigid, but may be effectively used in large bouquets. A fine pot-specimen is a very striking object.

15. *Pteris* (Platyloma) *ternifolia.*—The fronds are tufted,

about a foot long, linear-lanceolate and pinnate, the lower pinnæ ternate, becoming binate, or even simple, at top; the pinnules are linear and glabrous. The stipes is dark-brown and shining. This is a native of the western side of the continent of South America, the Sandwich Isles, &c.; requires a sub-tropical climate. Useful in large bouquets.

16. *Pteris* (Doryopteris) *sagittifolia.*—Very distinct and effective in a bouquet. The fronds are simple, elongate-arrow-shaped, at the end of a slender black stipes; they grow in tufts, and are from six to nine inches or a foot in length. A native of Brazil, and requires a stove temperature. A good tuft in a pot makes a pretty variety among others.

17. *Pteris* (Doryopteris) *hastata.*—This plant has the same habit as *Doryopteris sagittifolia.* In this, however, the shape of the frond is hastate-sagittate, the basal angles being prolonged and divergent. The stipes is dark-purple, and the frond is a foot or more in length. It is from Brazil, and requires a tropical climate.

18. *Pteris* (Doryopteris) *palmata.*—The fronds of this species are palmate, the central division twice-cleft, the others once-cleft, into broad lance-pointed segments. They are nearly a foot high, including the stipes, which is two-thirds of the height. A native of Caraccas, and requires a tropical climate. The plant forms a rigid tuft, and may be grown as a pot specimen as well as being used for large bouquets.

19. *Pteris longifolia.*—Elegant, but one of the larger habited kinds. The fronds are a foot-and-a-half or two feet long, pinnate, with opposite, narrow-elongate, almost linear pinnæ. The smaller fronds afford a nice variety in form for large bouquets. The habit is tufted, and a good mass is effective as a pot specimen. It is West Indian, and requires a tropical climate.

20. *Pteris serrulata.*—An East Indian plant, requiring a tropical climate. It is rather common, but a good mass forms an elegant potted specimen, and the smaller fronds, with their long drooping pinnæ, have a very good appearance in large bouquets. The fronds grow up in tufts, and are from a foot to 18 inches long, pinnate, with narrow, elongate, opposite drooping pinnæ, decurrent along the rachis, the lower ones divided into three or five segments, which are also narrow-elongate, or grass-like. From the drooping habit of the fronds, a mass has a very pretty effect.

21. *Pteris heterophylla.*—A very neat and elegant dwarf species, growing about 6 inches in height. The fronds are bipinnate, with cuneate, oblong, shining pinnules. Its small size renders it well suited for small bouquets. Its general aspect is something like an enlarged *Asplenium Rutamuraria.* It is a Jamaica species, and requires a tropical climate.

22. *Adiantum macrophyllum*.—This fine plant grows from a foot to a foot-and-a-half high. The fronds are pinnate, the pinnæ large, broad, and sub-opposite, acutely sub-falcate, with the margins inciso-serrate. They are of a beautiful green, contrasting admirably with the black rachis. Very effective in large bouquets, or grown in a pot. It is a native of the West Indian islands, and requires a tropical climate.

23. *Adiantum lucidum*.—This species grows about a foot high, and has pinnate fronds, with acute falcate pinnæ, set on the rachis by the lower angle of their base. It is a desirable kind either for large bouquets or for pot-culture. A native of Jamaica, and requires a tropical climate.

24. *Adiantum setulosum*.—Very delicate and elegant, proper for pot-culture as a small ornamental specimen, and the smaller mature fronds suitable for small bouquets. It grows a foot high, with bipinnate fronds, the lower pinnæ being bipartite; the pinnules are dimidiate, curved, oblong-obtuse, crenated along the superior margin. It is from Norfolk Island, and thrives well in a sub-tropical climate.

25. *Adiantum curvatum*.—One of the pedatifid species. It is Brazilian, and requires a tropical climate. The fronds grow 2 feet high, and are very elegant, the several long narrow branches being pinnate, with lanulate, or oblong-curved, crenated pinnules. Elegant for large bouquets, or for pot-culture.

26. *Adiantum Capillus-Veneris*. — The British maidenhair Fern. The black hairlike stalks of the fronds of this species support little fan-shaped leaflets or pinnules, which are irregularly notched around the margin. The fronds are very delicate and graceful, and mature ones, as of most of even the delicate adiantums, are suitable for bouquets, as they do not rapidly perish. This is certainly one of the most interesting and beautiful of the indigenous Ferns. "Two fronds, with two spikes of mignonette at the back of a white camellia, make a splendid bouquet." It likes warmth, and also a good share of shade and moisture, flourishing admirably in a house among the tropical Ferns.

27. *Adiantum trapeziforme*.—One of the larger adiantums and one of the most striking in its appearance. The fronds grow 2 feet high, and are supradecompound, with a shining black rachis and stipes, and bright-green rhomboidal pinnules, lengthened out at the upper exterior angle into a taper point; they are attached by wiry stalks, so as to become agitated by a slight breeze. Grown as a large pot specimen, it is very ornamental, furnishing a good supply of fronds suitable for large bouquets. It is a South American species, and requires a tropical climate.

28. *Adiantum pubescens*.—A New Zealand species, succeeding well in a warm close greenhouse. The fronds are suitable

for bouquets of moderate size, and are very elegant, being of the pedatifid class, that is, divided into several branches from the top of the rachis; the branches are long, drooping, and feather-like. The fronds are a foot high, about 6 inches of which height forms a slender wiry stipes, which becomes forked into about seven narrow pinnate branches or pinnæ; the pinnules have a rhomboidal outline, and are pretty thickly set.

29. *Adiantum cuneatum.*—This, one of the prettiest, grows from 6 to 8 or 10 inches high, with the fronds more or less curved or nodding. The fronds are pinnate, with twice or thrice-divided branches, the rachides of which and the little footstalks of the pinnules are of hair-like delicacy; the pinnules are between rhomb and wedge shaped, and are deeply gashed. It is altogether very elegant, and when not grown too luxuriantly is particularly adapted for small bouquets. It is a Brazilian species, and requires a tropical climate.

30. *Adiantum hispidulum.*—A very delicate and pretty species, clothed with fine hairs. It grows 6 or 8 inches high, the fronds alternately branched, the rachides of the lengthened branches being elegantly curved, and bearing small rhomb-shaped pinnules. It is well suited for bouquets. Introduced from New Holland, and requires a warm temperate climate.

31. *Onychium lucidum.*—A very neat habited Fern, with a somewhat creeping caudex, bearing smooth, light, graceful fronds which measure from 8 to 18 inches in length, and are supra-decompound, with the narrow ultimate divisions of the pinnules deeply notched. It may appropriately be used for bouquets according to its size, and is very elegant when growing. A native of Nepal, and thrives in a sub-tropical climate.

32. *Blechnum gracile.*—A graceful tufted-growing species, attaining a foot or less in height, pinnate, the fronds having about four pairs of lanceolate, subfalcate, denticulate pinnæ, and an auricled terminal, one 2 inches long. Native of Brazil, and requiring a tropical climate. It forms a very pretty variety for bouquets.

33. *Blechnum polypodioides.*—A Brazilian species, with narrow curving lance-shaped fronds, a foot long or upwards, furnished with short oblong bluntish pinnæ, which decrease in size towards both extremities of the frond. The fronds grow in a tuft, and from their form and curving disposition have a very elegant effect, both on the plant and when cut for bouquets. It requires a tropical climate.

Asplenieæ.

34. *Asplenium lucidum.*—A large growing but very striking-looking species, ornamental when grown as a good specimen, and the smaller fronds suitable for large bouquets. The texture is

leathery, the fronds pinnate, 2 feet high, with narrow elliptic acuminated, serrated pinnæ, which are deep green, and have a shining upper surface. It is a native of New Zealand, and thrives in a sub-tropical climate.

35. *Asplenium marinum.*—The fronds of this English species are leathery and pinnate, the pinnate being of an oblong form and crenately serrate on the margins; they are from 6 to 10 inches long, and grow in a tuft. Either as an entire plant, or cut for bouquets, this is a good-looking object.

36. *Asplenium elongatum.*—A Malacca species, with something like the appearance of our native sea spleenwort (*A. marinum*), but having lighter, more elongated fronds. These are a foot long, quite narrow, and pinnate, with oblong lanceolate pinnæ. The fronds of this species, which grow in a tuft, might be employed in the construction of bouquets. It requires a tropical climate.

37. *Asplenium auritum.*—The fronds of this species are tufted, broadly lanceolate, a foot or upwards in length, with opposite narrow-lanceolate pinnæ, set on at right angles with the rachis; these pinnæ are from 1 to 2 inches long, acuminate, and inciso-serrate, with an auricle at the base on the upper side. They have a shining surface. It is a West Indian species, and requires a tropical climate. The fronds are suitable for large bouquets, or make a very good appearance on the plant.

38. *Asplenium monanthemum.*—Very beautiful, either as a small pot specimen, or cut for small bouquets. The fronds are slender, 6 to 9 inches high, pinnate, with obtuse trapeziform pinnæ, having the upper edge crenated. Native of the Cape of Good Hope and of Madeira. May be grown in a warm greenhouse climate, though it thrives well associated with tropical Ferns.

39. *Asplenium formosum.*—An erect growing and very pretty species. The fronds grow about a foot in height, and are pinnate, with close-set oblong crenated pinnæ. It forms a very neat pot-plant of the smaller sort; the fronds are also very suitable for bouquets. A native of Caraccas, and requires a tropical climate.

40. *Asplenium Adiantum nigrum.*—This ranks among the handsomer of our indigenous Ferns, and is also a rather common one. It is of a tufted habit, but the fronds are spreading and curved downwards; they are shining and elegantly cut, sometimes twice and sometimes thrice-pinnate. It requires a light soil, and may be grown well in a frame. The fronds are suitable for bouquets, and being of a thick rigid texture, they are very enduring; they are from 6 to 8 inches long.

41. *Asplenium fragrans.*—A moderate-sized species with finely divided fronds, which are of a gracefully drooping habit,

thick and leathery in texture, and having a smooth shining surface. The fronds are from 6 inches to a foot long, twice, sometimes thrice-divided, the lobes being narrow and serrated. The fronds may be used in bouquets, the smaller ones in small hand bouquets; the entire plant is very elegant. It is a Jamaica species, and requires a stove climate.

42. *Asplenium* (Darea) *cicutarium.*—A very elegant-tufted growing species, with pinnate decurved fronds, the branches of which are set with finely-divided pinnules. Its colour is usually a pale green. The fronds vary from six inches to a foot in length; and may be employed, according to their size, in bouquets; but the entire plant is very elegant. A native of Jamaica, and requires a stove temperature.

43. *Asplenium* (Darea) *viviparum.* A remarkable looking Fern, with small ovate fronds, divided into very narrow needle-shaped segments. The fronds are tripinnate, and the pinnæ being rather close, they look something like a mass of interwoven threads. These fronds, which form a tuft, are frequently viviparous, a circumstance which often occurs also in several other Ferns. Pretty and distinct for bouquets. It requires a stove climate, being a native of the Mauritius.

44. *Asplenium* (Darea) *diversifolium.*—Remarkable for the various leafing of the fronds, and withal a very elegant plant. The fronds grow in a tuft two feet high: some are bipinnate, with the pinnules broad, roundish, and notched; others are tripinnate, the pinnules being again divided into numerous (9-12) linear segments. It is a native of Norfolk Island, and though it does not require a hot climate, yet it thrives well in a house with tropical species Useful for large bouquets.

45. *Asplenium* (Acropteris) *canariense.*—A very elegant species, the fronds being a foot-and-a-half or two feet long, twice pinnate, with the points of the pinnæ much attenuated and deeply incised. The pinnules are elongate, wedge-shaped at the base, with about two deep incisions. It is a greenhouse species, native of Teneriffe; the size of the fronds renders them suitable only for large bouquets, but their singularly laciniated fronds are well adapted for this use. The plant is very ornamental in the growing state; the fronds grow in a tuft.

46. *Asplenium* (Acropteris) *præmorsum.*—A singular-looking yet elegant plant, in the way of the last; the tufted fronds are bipinnate, a foot or more in length; the pinnæ being divided into alternate sessile wedge-shaped pinnules, the apices of which are bluntish, and more or less gashed and toothed. It is a Jamaica species, and requires a tropical climate. The plant is ornamental, and the fronds, according to their size, well suited for bouquets.

Aspidieæ.

47. *Polystichum aristatum.*—This is a native of Norfolk Island, and requires a greenhouse climate; it, however, does well in a fern-house. The fronds grow in a tuft, a foot high, and are ovate, lengthened out into a long narrow point; they are bipinnate, at least at the base of the pinnæ, which are each lengthened out into a point similar to the apex of the frond. The texture is thick, and the colour a shining green, so that they are well adapted for bouquets.

Dicksonieæ.

48. *Davallia canariensis.*—The well-known Hare's-foot Fern. It is a very elegant species, suitable for cutting for large bouquets, but also well adapted for pot culture. The fronds are broadly pentangular, decompoundly pinnate, with very narrow ultimate divisions; they are of a durable texture. It requires the climate of a greenhouse, being a natural inhabitant of the Canaries. It is the slowly-creeping caudex which resembles a hare's foot.

Schizæaceæ.

49. *Anemia tenella.*—A very pretty little plant, with slender fronds growing in a tuft. The fronds are 6 or 8 inches high, and consist of a slender stipes three or four inches long, bearing a barren or leafy branch two or three inches long, pinnate, with oblong laciniate-pinnatifid pinnules, and a pair of fertile spikes, which appear almost cylindrical, but in reality are branched on the same principle as the leafy branch: these fertile spikes look not unlike the close inflorescence of some kinds of grass. It is from tropical South America, and requires a tropical climate.

II. The species which admit of the entire plant being grown and employed for decorative purposes are more numerous. Those already enumerated, if cultivated in a superior way, are amongst the most beautiful of the whole group; but there may be added to them many others, which are naturally of too large a size for use in the construction of bouquets.

Thus enlarged, this group will consist of plants that may be managed in two ways: they may either be grown in pots, to be removed when in perfection to those situations which it is required to decorate; or they may be planted on any kind of artificial substitute for the tree-trunks and rock-surface to which many of the kinds are found affixed in a state of nature; and that, according to their constitution, either in structures in

which an artificial tropical climate is maintained, or in the natural climate of this country.

Well-grown examples, cultivated in pots, of any of the species mentioned in this paper (as well as of many others) form extremely graceful objects when set in vases of elegant design, the soil in which they are growing being hidden by a covering of fresh green well-selected moss. Such ornamental objects may be placed in the shady parts of conservatories, in corridors, or in the drawing-room with good effect; but the hardier kinds,—or, if more tender, those of the most rigid texture,—should be placed in the most exposed positions. It would, moreover, in the case of all these plants placed in an atmosphere materially different in its hygrometric condition from that in which they were grown, be found highly advantageous to the plants to remove them frequently back again for a period to the respective situations where their cultivation had been carried out, in order to recruit them; and that they may not suffer, as they might otherwise do, from too lengthened an exposure to a drier and a cooler atmosphere. In all cases where the plants are thus employed, they should have an abundant supply of water at the root, to prevent the stagnation of which in the soil great care must be taken in the potting of the plants, as will be explained farther on. Besides this, water should never be allowed to stand in the feeders beneath the pots. In most cases, too, the plants will be refreshed by a gentle daily syringing, using the instrument with a very fine rose; but if the kinds are tender, or the season be the winter, tepid water only must be used, and the operation should be performed in a situation where the plants would not be at all exposed to the influences of a low temperature or a chilling breeze. It is self-evident that in no case must the plants be brought out of even a moderately warm climate to be placed in a position where the temperature is permanently materially lower than that they have been habituated to. Any decrease they may be submitted to, must be brought about gradually.

POLYPODIEÆ.

50. *Polypodium vulgare, var. cambricum.*—This is a very elegant variety of the common polypody. Under slight protection it is evergreen, and forms in time, by the extension of its slowly-creeping caudex, a tuft of oblong ovate fronds, deeply divided on each side into numerous lobes, the margins of which are again deeply lobed with saw-edged pointed segments. The protection of a frame is sufficient for this indigenous plant. It prefers very light soil.

51. *Polypodium effusum.*—The fronds of this species are

larger, and supra-decompound. They have a very light feathery appearance, from the small size and great number of their ultimate divisions. The plant is only suitable for pot-culture, but in that state is very elegant when somewhat checked in its vigour. It is a Jamaica species, requiring a tropical climate.

52. *Gymnogramma tartarea.*—A free-growing plant, a good tuft, forming a fine-looking pot specimen. The fronds are two feet or more in height, and of a broad oval outline, bipinnate, with lance-shaped slightly falcate deeply-notched pinnules, the under side of which is covered with a white powder. It is a West Indian species, and requires a tropical climate.

53. *Gymnogramma calomelanos.*—This species, the fronds of which grow in tufts from one to two feet high, with bipinnate broadly-lanceolate fronds, and pinnatifid lanceolate-acuminate pinnules, has the under surface of the pinnules covered with a white mealy powder. It is suitable for pot culture, and requires a tropical heat, being a native of the West Indies. This and the preceding are of the class sometimes called Silver-Ferns, from the whiteness of the surface of their fronds.

54. *Gymnogramma chrysophylla.*—Of the same habit and size as the two preceding, and also belonging to that set of Ferns which are remarkable from having one or both surfaces of the fronds more or less covered with a coloured powder. In this species the powder, chiefly confined to the under side of the pinnules, is yellow. The fronds are bipinnate. It is a West Indian plant, and requires a tropical climate; a large specimen in a pot is very ornamental, in consequence of the drooping or curving habit of the fronds.

55. *Gymnogramma sulphurea.*—The fronds of this West Indian species are about a foot long, and bipinnate; they are more delicate than those of the last species, and covered more copiously, and on both surfaces, with yellow mealy dust. It requires a tropical climate. The species which have this yellow dust are sometimes called Gold Ferns.

56. *Gymnogramma chærophylla.*—This species grows from a foot to 18 inches high, the fronds in tufts, ovate-deltoid, thrice pinnate, or sometimes still more highly compound; the ultimate segments are small and narrow. It is from South America, and needs a tropical climate.

PTERIDEÆ.

57. *Pteris* (Cassebeera) *hastata.*—This species varies from about a foot to 2 feet in height, the fronds dark-green, bipinnate, with ovate-lanceolate sub-hastate pinnules; the stipes and rachis black and shining. It forms a good-looking pot specimen, con-

trasting with many others by its heavy colouring. A greenhouse species, native of the Cape of Good Hope.

58. *Pteris* (Platyloma) *falcata.*—A New Holland species, cultivable in a greenhouse. The fronds grow in tufts from 1 to 2 feet long, erectish, pinnate, with opposite sickle-shaped pinnæ. It forms a distinct-looking pot specimen.

59. *Pteris cretica.*—The fronds of this plant grow in a tuft, and are from a foot to 18 inches high, pinnate, with opposite elongate-lanceolate pinnæ, the lowermost of which are 2 or 3-parted. It is an elegant plant. It is a native of Candia, and requires a greenhouse climate.

60. *Blechnum Spicant.*—This common, hardy, indigenous species forms a splendid tuft when grown luxuriantly. The fronds are of two kinds, barren and fertile, the latter more erect and taller than the former; both kinds are narrow-lanceolate, the barren ones pectinate-pinnatifid, the fertile ones pinnate, with still narrower and more distant segments. The barren fronds may be used in bouquets according to their size, but a luxuriant tuft is very ornamental. To attain this luxuriance the shelter of a frame, a large-sized pot, and a rather abundant supply of moisture are requisite. The fronds perish in the autumn, and are renewed in spring.

61. *Blechnum australe.*—This species has lance-shaped pinnate fronds a foot or more in length, thickly set with cordate-lanceolate pinnæ. The fronds curve gracefully, and form an elegant tuft when in a good state of development. It requires a sub-tropical climate, being a native of the Cape of Good Hope.

62. *Doodia Kunthiana.*—A pinnate-fronded plant, which may be cultivated in a greenhouse. The fronds grow from 1 to 2 feet long; the pinnæ are ovate or lance-shaped, fringed with prickly serratures. When growing luxuriantly it becomes a not inelegant pot-plant, the fronds becoming somewhat drooping. It appears to be an Australian species.

Asplenieæ.

63. *Athyrium Filix-femina.*—This is one of the most beautiful of Ferns, and is very suitable for pot-culture. It is one of the larger class, the fronds growing from 2 to 3 feet long; they are bipinnate, gracefully drooping, and of light feathery composition. It is hardy, being indigenous to this country, but bears a moderate degree of heat well. The fronds die in autumn, and are renewed annually in the spring.

64. *Athyrium Filix-femina, crispum.*—This grows like a tuft of curled parsley, the apices of the fronds, which are not more than 6 or 8 inches long, being, as well as the apices of the pinnæ, proliferous. It is a monstrosity, but is a very elegant

pot Fern. The fronds of this also perish, and are renewed annually. It should be grown in a frame.

Aspidieæ.

65. *Lastrea decurrens.*—An elegant plant, with lance-shaped fronds growing in a tuft; they are a foot and upwards in length, and have alternate decurrent pinnæ, which are pinnatifid with rounded lobes. It is a native of China, and does well in a warm greenhouse climate.

66. *Lastrea rigida.*—The fronds of this species are 2 feet long when well grown, and are twice pinnate, and of a lanceolate figure; the pinnules are very elegantly cut, and the whole plant is ornamental. It is hardy, being a native species, occurring on limestone mountains in the north of England. If grown for ornamental purposes, it should be kept in a frame. The fronds are annual.

67. *Polystichum Lonchitis.*—The Holly Fern: it is remarkable among the indigenous species of Ferns for its narrow pinnate fronds of rigid texture, having the subfalcate pinnæ fringed with spiny serratures. It is a rare native species, requiring plenty of drainage in a cultivated state. Besides the elegant appearance of the entire plant, small fronds of this kind may be used in bouquets.

68. *Polystichum angulare*, and a variety named *P. a. angustatum*,* are exceedingly beautiful pot-plants of the larger class. The fronds grow from 2 to 3 feet long, and are bipinnate, gracefully drooping, and having a feathery lightness of appearance. They are perfectly hardy, and, under protection, become almost evergreen. They require large pots, and to have space to spread their fronds. A frame is sufficient protection, but they do well fully exposed.

69. *Nephrolepis exaltata.*—This forms a very elegant pot-plant, the extremely long, narrow, pinnate fronds drooping in most graceful curves when sufficient space is allowed them. The fronds, which form a tuft, are from 2 to 3 feet long, the pinnæ lance-shaped, an inch or two in length. They assume a somewhat more graceful aspect when in some degree checked than when allowed to become very luxuriant, which, being a free-growing plant, they have a tendency to do. It is a native of Jamaica, and requires a tropical climate.

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* Handbook of British Ferns, intended as a Guide and Companion in Fern Culture; with engravings of all the species, and the principal varieties. By Thomas Moore, F.B.S. E. and L. London, Groombridge.

Dicksonieæ.

70. *Davallia elegans.*—This species, which is generally distributed over the East Indies, as well as tropical New Holland, has tall sub-coriaceous fronds, three or four times divided. It is, in fact, a highly compound Fern of considerable size, and really very elegant when grown to perfection as a pot-plant. Being a tropical species, it requires a tropical climate under artificial cultivation.

Gleicheniaceæ.

71. *Gleichenia microphylla.*—This is an Australasian species, with dichotomously-divided fronds, the branches pinnate, and the pinnæ divided into small close segments. The habit is singular and interesting. It should be cultivated in a warm close greenhouse.

Schizeaceæ.

72. *Lygodium scandens.*—A climber, extending 10 or 12 feet in length. The stems throw off opposite branches; these branches are decompound, the divisions being mostly ovate, and on the fruitful parts of the frond fringed round the margin with even, oblong, projecting, teat-like masses of fructification. It is a most elegant climbing plant, native of the East Indies, and requiring a tropical climate.

73. *Anemia Phyllitidis.*—A very distinct Fern, forming a tuft of stems, growing from 1 to 2 feet high, or more according to the strength of the plant and the circumstances of its growth. Each perfect stem bears a barren branch or leaf, and a fertile branch, which latter looks somewhat like the close panicle of some grass. The leafy branch is pinnate, with a few large, ovate leaflets, so that the branch has something the appearance of a leaf of the common ash-tree. A good mass is, however, effective, from its distinct appearance. It is a native of tropical South America, and requires a tropical climate.

74. *Mohria thurifraga.*—This is also a distinct-looking species. It forms a pretty pot plant. The fronds are elegantly cut, narrow-lanceolate, sub-bipinnate with short alternate pinnæ, and from six inches to a foot long. The pinnæ on the barren parts of the fronds bear little oblong pinnules, which are deeply lobed, and these lobes are again cut into several linear segments. The pinnules of the fertile pinnæ are not incised, but bear the sori along the margins. A native of the Cape of Good Hope, and requires a sub-tropical climate.

75. *Osmunda regalis.*—A truly noble object, when in a high state of development. It is indigenous, growing in boggy situ-

ations. The fronds, which form a large tuft, grow erect, two, four, six, or eight feet high, with opposite pinnate lateral branches; the upper part of the stems changed into a mass of little spikes of fructification, which when mature assumes a brown colour. Being a large growing plant, it requires a large pot, and should be kept rather damp at the root.

A few general remarks on the cultivation of Ferns in pots may here be appropriately appended, and these will be offered under the following heads:—1. Structures for Ferns; 2. Propagation of Ferns; 3. Soil and Potting; 4. Atmospheric Conditions; 5. Watering; 6. Insects.

1. Structures for Ferns.

Ferns do not in a general way under cultivation associate well with other plants; orchids, however, are an exception; the degree of humidity kept up, and the shade afforded, in the case of orchid houses being favourable to their growth. Low buildings are preferable for them, in consequence of the greater facility with which a close or calm atmosphere can be maintained; and these are all the better if they face the north, for then a greater degree of light can be allowed them, without so great a risk of exposing them to bright sun rays, which should, as far as possible, be avoided.

The tropical Ferns delight in heat; but in regard to its application they follow the same laws as other plants, so that no particular application of the heating power, or medium, is required in constructing a Fern house. A mild bottom heat is, however, desirable beneath the stages on which the pots are placed, chiefly on account of the water which is necessarily thrown down in raising the required degree of atmospheric moisture, which, especially if the stages are of stone or slate—two of the best materials in other respects—causes an injurious chilliness about the roots.

Of atmospheric moisture these plants need an abundant and almost unvarying supply in the form of insensible vapour throughout the entire period of their growth. Even in winter, though a less degree of moisture should be employed in conjunction with the lower temperature universally to be adopted at that season, yet, proportionately with other plants, a large supply of moisture should, even at that season, be given to such Ferns as are at all in a growing state. Those of deciduous habit, that is, those whose fronds die down annually, are the better for being kept somewhat drier from the time the fronds decay until they again renew their growth.

So large a supply of atmospheric moisture being required, a

large extent of evaporating surface should in consequence be provided; and in the interior of the house as much absorbent material as possible should be employed, so that by the aid of syringing the evaporating surface may be extended almost at pleasure. In buildings of this kind, if hot water, the best of all heating mediums, be employed, it should be conducted in pipes cast with an open trough or gutter on the upper side, to be kept filled up with water whenever a moist atmosphere is required. If this trough is divided into compartments, a varying amount of evaporating surface may be employed, according to the degree of moisture required. The floor, moreover, should be covered with a wooden pathway of trellis-work, in order that the bottom may, when necessary, be flooded with water. With such appliances, skilfully employed, there will be no difficulty in maintaining the atmosphere, as regards its humidity, perfectly suitable to the growth of Ferns.

Fern houses should be provided with a shading, to be used in bright, sunny weather; at other periods there is no necessity for nor advantage in its employment. If the building has not a north aspect, this shading becomes indispensable.

The best of all structures for the growth of exotic Ferns are low, close pits, in which the due supply of heat and moisture is provided for. Such situations are only unsuitable for the larger, coarser growing kinds, which are generally the least of all suitable for decorative purposes.

The few hardy species which may be grown for the purpose of supplying fronds for cutting, or as decorative plants, do well in a cold frame kept nearly closed, and in which proper attention is paid to the hygrometric condition of the atmosphere. In limited establishments the species inhabiting temperate as well as tropical latitudes may be accommodated in one structure; for those of temperate climates will bear without material injury, and in some instances with advantage, the extra heat afforded to those of the tropics. Where, however, the collection of species or the number of plants justifies such a course, it will be better to place these two classes in separate pits or small houses, where it will be easy to apply a less degree of heat to those which need the less degree. Under this arrangement, if there are but few of the hardy group grown, they may be placed along with those of temperate climes.

2. Propagation of Ferns.

Among Ferns the caudex assumes two distinct forms. In some species it is horizontally creeping, forming an underground stem, and throwing up its fronds or clusters of fronds at intervals. Those of this habit may be propagated by dividing the caudex

so as to separate the fronds or crowns, with some portion of the stem (caudex) and roots attached to each: for wherever there are separate and distinct crowns or buds, though attached to the same caudex, there is no material difficulty in making separate plants. In other species the caudex is not creeping, but erect and usually short; sometimes having only a single crown at the top, and rarely producing offshoots, in consequence of which propagation by division is necessarily tardy; but at other times readily dividing into separate tufted crowns, in which case duplicate plants may be obtained by separating these in the usual way, with roots attached.

The separated plants should be kept rather closer than those which are established, at least until they have taken fresh root; and they are benefited by a light sprinkling of water about twice a day. In potting, too, they should be fixed firmly, the crown being just level with or clear of the surface. If they have numerous roots when newly divided, and these are carefully adjusted among the soil, they will thus be held firmly; but in case the roots are few, and the fronds rather preponderating in weight, a couple of little stakes should be used, to which the fronds or some of them should be tied, for the purpose of steadying the crowns; this greatly facilitates their rooting, which is, on the other hand, prevented or delayed, when they are moved to and fro by every disturbing cause. The rooting of a delicate plant is generally facilitated by covering it directly with a bell-glass, which, however, should be dispensed with, gradually, as soon as the plant has become fairly established.

Ferns may also be propagated by their seeds, technically called spores. These spores are enclosed in minute cases collected together into masses, usually on the under surface of the fronds, but sometimes at their margins, and occasionally on branches quite distinct from the leafy parts of the plants. They are very minute, and quite indistinguishable in appearance from fine brown dust; yet when scattered over any constantly damp surface they become developed as living individuals. Thus from atoms almost imperceptible, spring up plants which in some instances attain the stature of trees, and not uncommonly reach the height of from 5 to 10 feet. The manner in which the process of development proceeds in these cryptogams must appear exceedingly curious to those who have only watched the germination of the seeds of phænogamous plants. At the first, a small dull-green cellular crust or scale of almost transparent texture appears; by degrees this extends—slowly, and its margins become crisped or indented; then at one point of the margin a gradual thickening takes place, downwards as the nucleus of the future root, and upwards as that of the future fronds; next, a small pale-green

leaf-like body, usually transparent, and nearly or quite simple, is seen to spring up; subsequently, at the base of this rises another somewhat more perfect—more divided, if the mature frond is a compound one—and afterwards each succeeding development approaches, though by slow degrees, nearer and nearer to the condition of the mature plant, which maturity is not attained until a considerable though varying period of time has elapsed. Until they have nearly or quite reached maturity, seedling Ferns are exceedingly puzzling.

I may quote here the following remarks which I have had occasion to make elsewhere,* on the process of raising Ferns from the spores:—

"Half-fill some shallow wide-mouthed pots with broken crocks, and on this put a layer of about 2 inches of little lumps of spongy peat soil mixed with soft sandstone, broken in small lumps, of the sizes of nuts and peas; this compost should not be consolidated. Next, shake or brush very gently over a sheet of white paper, a frond of the species to be propagated; the fine brown dust thus liberated consists of the spores in greater or less quantity, intermixed with more or less of the spore-cases, some of which usually become detached in the course of the process. This dust is then to be regularly and thinly scattered over the rough surface of the soil, which is immediately to be covered with a bell-glass large enough to fit down close within the pot rim. The pots are at once to be set in feeders, and these are to be kept filled up with water; they may either be placed under a hand-glass in a cold frame, or in a greenhouse, as may be most convenient. Some time, varying according to the freshness or otherwise of the spores, will probably elapse before germination commences. The first indications of germination will consist in the appearance of little patches of a green crust resembling a liver-wort; subsequently, small imperfect fronds will appear, and these will become more and more perfect in succession. During this time the supply of water must be kept up, and the glasses kept close over the young plants. When two or three fronds are developed, the glasses should be tilted on one side for a short time every day, and ultimately entirely removed, the pots still being retained under a hand-glass; after a week or two they may be taken up, carefully separated, and potted singly in small pots. The young plants should still be kept under a hand-glass until established, and then removed to a cold close frame, gradually inured to the degree of exposure respectively proper for each, and ultimately submitted to the same treatment as the mature plants."

* Hand-book of British Ferns.

The foregoing directions refer to the hardy species. Excepting that in this case the seed-pots may be placed in the Fern-house, they apply equally to the more tender kinds. The surface of the soil ought not to be watered after the spores are sprinkled on it, as the water is liable to wash them away, and the soil will be kept sufficiently moistened by capillary attraction if the saucers beneath the pots are kept filled up with water. It is also advisable to roast the soil employed, in order to kill the germs of any other plants that may be contained in it.

3. Soil and Potting.

A good general compost for pot Ferns may be formed of fibrous heath-soil broken up into lumps as large as walnuts (or smaller for small pots), and of perfectly decayed leaf-mould, these two ingredients being used in about equal proportions. To this is to be added a greater or less quantity of clean gritty sand, the larger quantity of this ingredient being employed for the smaller and more delicate rooted of the species, and the lesser quantity for the more robust kinds, which latter are further benefited by the addition of about a fourth part of turfy loam. The ingredients of this compost ought to be very intimately blended. When used for potting, the soil should be in a medium state between wet and dry, rather inclining to the latter.

The pots are to be prepared by placing a large flat piece of potsherd over the hole in the bottom, and on this a layer of broken bricks, potsherds, or charcoal, sufficient to fill up from one-fourth to one-third of the depth of the pot; the broken crocks for the smaller pots should be of the size of peas and nuts, and for the larger pots twice that size. On these place some of the fragments of the turfy soil. Set the plant in the pot so that its crown may be about level with the pot rim, or rather above it, and then fill in among its roots carefully with the soil, throwing in, as the process proceeds, a handful or two, or more, of small lumps of charcoal, such as have been already alluded to; the whole should be made moderately firm. When the plants are removed to their respective positions they should have a thorough watering. Provided that the proper precautions are taken to secure efficient drainage, the pots may with advantage be rather large. Thus a strong plant of a species bearing fronds of a foot or so in length should have a pot of at least a foot in diameter; and a species producing fronds of half this size may be placed in a pot 5, 6, or 8 inches across, according to the size and vigour of the tuft or crown.

Excepting in the case of some of the most delicate kinds, which require a little extra care and nicety in the operation, one mode of potting may be recommended for all the species con-

templated in these remarks, whether they are indigenous or exotic, hardy or tender. Some of the most vigorous-growing species may, perhaps, not actually require so much nicety in the performance of the operation as that here directed; but as they are to be grown into objects of ornament, and not of mere existence, it is proper that each act of culture should be well performed.

4. Atmospheric Conditions.

A moist climate has been already spoken of as generally favourable to the development of Ferns. In adapting a climate to suit the tropical species, it will therefore be necessary to render the atmosphere hygrometrically charged in accordance with the extra heat which these require. Saturation of the atmosphere should, in fact, be almost unvaryingly maintained, at least while the plants are in a growing state. In winter, when the temperature is kept lower than during the remainder of the year, rather less moisture should be dispersed in the atmosphere; but those plants whose fronds are persistent through the winter must not at any time be kept in a very arid climate.

The tropical species require an average day temperature of about 70°, decreased to 60° in winter, and lowered at night to 55° or 50°. The species which are natives of temperate climates require a day temperature ranging from 40° to 60°, permanently lower in winter than in summer, and in all cases lower by night than by day: from 35° to 40° will be a sufficiently high night temperature.

The hardy and half-hardy species may be placed in a frame kept moderately close at all times, and in winter covered at night with mats. The hardy species do not absolutely need this protection, but the shelter thus afforded is favourable to their development. In a green-house temperature, the indigenous Lady-fern is an object of exquisite elegance. Shade, during bright sunny weather, is decidedly advantageous to these plants.

5. Watering.

Ferns should never be suffered to become dry. When growing, they require a free supply of water at the roots; but when at rest, or partially so, a moderate quantity, enough to keep the roots fresh and succulent, is sufficient. They luxuriate, however, in a damp atmosphere, and are consequently much benefited by being frequently sprinkled over-head with pure water; and this is especially the case with all those species which are cultivated in an artificially elevated temperature. Rain-water, or at least soft water, should be made use of; and for those which are grown in a warm climate, it should always be used in a tepid

state. Though they will not flourish without an abundant supply of moisture, yet it should never be allowed to stagnate about the crown or the roots.

6. Insects.

With ordinary care, Ferns are not liable to suffer material injury from the attacks of insects. The young fronds, however, when but partially developed and in a very succulent state, are sometimes attacked by aphides, which, if not removed, do them considerable injury. The remedy, however, is simple. The damp atmosphere, and the frequent washings and syringings which the plants ought to have, are greatly conducive to rid them of insects as well as filth of every description.

NEW PLANTS, ETC., FROM THE SOCIETY'S GARDEN.

9. Navarretia pubescens. *Hooker and Arnott.*

Raised from seeds received from Mr. Hartweg, January 5, 1848, and said to be found in fields about Sonoma, in California.

A dwarf, branching, hairy plant, not more than six inches high. Leaves bipinnatifid, with linear, acute, somewhat divaricating lobes. Flowers small, in close heads, greyish blue, with a purple tube less than half an inch long, a dark eye, and prominent white anthers. The lobes are nearly round, and overlap each other. The herbage has little smell.

A hardy annual, requiring the same kind of treatment as Gilias, Leptosiphons, and similar hardy annuals. The seeds should be sown thickly in the open borders in spring; the plants grow about six inches in height, and flower in June and July. It is rather showy when seen in masses.

June 27, 1848.

10. Navarretia cotulæfolia. *Hooker and Arnott.*

Raised from seeds received from Mr. Hartweg in May, 1847, and January, 1848, and said to be an annual growing only two inches in height, in fields about Sonoma, in California.

Stem straggling, reddish, scarcely hairy. Leaves soft, pinnatifid, or somewhat bipinnatifid, with nearly terete, linear, acute

segments. Flowers in close axillary heads, on stalks shorter than the leaves, small, white, inconspicuous, with linear segments to the corolla. Calyces very spiny. Smell of the herbage foxy and disagreeable.

A hardy annual, requiring the same kind of treatment as Leptosiphons. The seeds should be sown thickly in the open border in spring. It flowers in June and July, and is suitable for rockwork, growing about two inches high.

June 28, 1848.

11. Limnanthes alba.* *Hartweg.*

Seeds were sent from California by Mr. Hartweg.

Like L. rosea, this has the habit of Limnanthes Douglasii, but the flowers are white, not yellow or pink. and their stalks are very long. It is of interest in gardens, chiefly for the decoration of heavy damp places, where better flowers will not grow. In such situations all the species thrive and become ornamental, retaining their freshness and flowering incessantly through the whole summer.

It may be a question whether they would not be useful salads, as they all possess the agreeable warmth of Tropæolums without being quite so pungent.

Nov. 22, 1848.

12. Callistemon brachyandrum.†

The seeds received from his Excellency Captain Grey, said to have been collected on the north coast of Australia, in 1843.

A stiff bush, with the habit of other species of the genus, but with deep-green, narrow, pungent, channelled leaves, having conspicuous dots on the under side, and no veins. The spikes of flowers are loose, and not more than 2 inches long, with very downy calyxes, the number of whose divisions varies from 5 to 6. The petals are dirty white, short, downy, concave, and inconspicuous. The stamens are deep rich crimson, not more than twice as long as the petals, and quite straight; the anthers are of a

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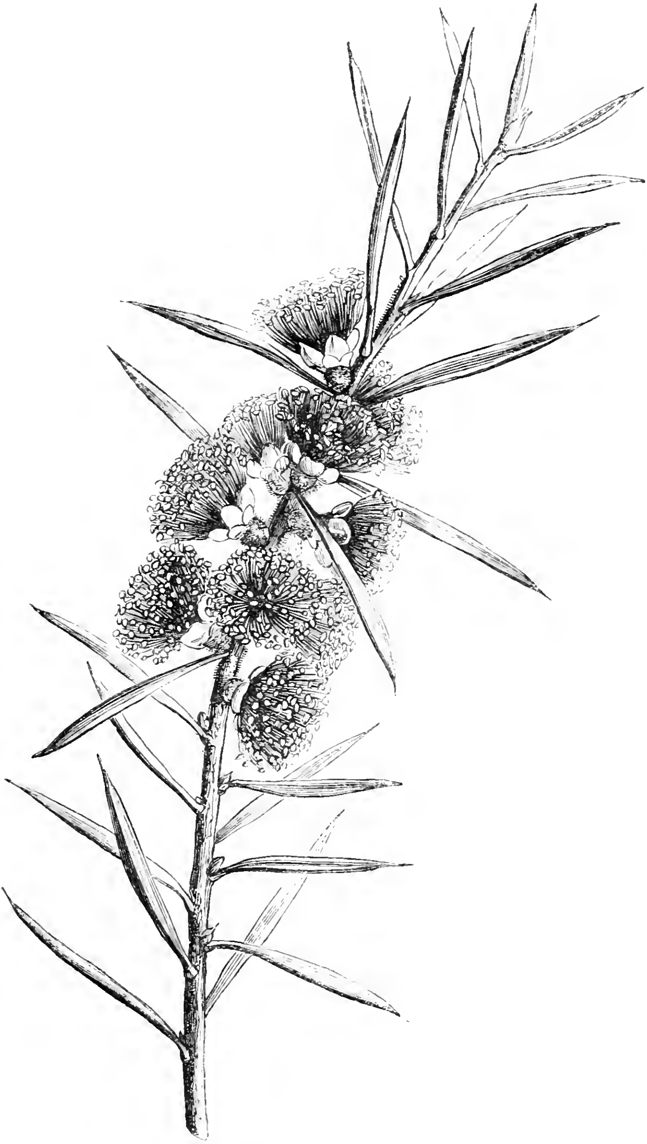
* L. *alba;* foliis elongatis pinnatis, laciniis sessilibus ovatis acutis integris trilobisque, pedunculis longissimis, calycibus pilosis, petiolis basi barbatis. —J. L.

† C. *brachyandrum;* ramis teretibus pubescentibus, foliis linearibus pungentibus canaliculatis enerviis, calyce tomentoso, petalis inæqualibus pubescentibus staminibus sanguineis duplo brevioribus.—J. L.



Callistemon brachyandrum.

bright golden yellow, and form a beautiful contrast. This shortness of the stamens is a striking feature in the species.

It is a small hardy greenhouse shrub, which grows freely in a mixture of sandy loam and peat. It is increased by cuttings of the young wood in the usual way, and flowers from August to November. It is handsome enough to deserve general cultivation.

Nov. 25, 1848.

13. Epidendrum gravidum.*

Received from Mr. Hartweg, in February, 1837, and said to be collected at Xapatam, in Mexico.

This curious species has a scape nearly 6 inches high, bearing at the end about four long-stalked, horizontal green flowers, which never open, but stand on the end of a large fusiform deep olive-green ovary, covered with pale-green warts. The stalk of the ovary is about half an inch long, the ovary itself 1¼ inch, and the flower scarcely half an inch.

It is certainly as far removed from beautiful as any plant can be; but its singular distended ovary, which is not very unlike a green leech studded with grains of carbonate of lime, has a most curious appearance. The plant does not seem to possess the power of opening its flowers, such as they are.

A mere botanical curiosity.

March 16, 1849.

14. Cœlia macrostachya. *Lindley, in Bentham's Plantæ Hartwegianæ*, p. 92.

Received some years since from Mr. Hartweg, who collected it in Guatemala; and also from Mr. Skinner.

The expectations respecting the ornamental appearance of this plant have not been realized. It has been found in a wild state with a close flower-spike as much as a foot long, and its blossoms are reported to be deep red; but in cultivation it has hitherto gained no such size, and the colour is only a pale rose, without any brilliancy.

It produces ensiform leaves from 1 to 1½ inch broad, and nearly 18 inches long, and the flower-spike should stand at nearly the same height. At the base of the spike are a few broad concave,

* E. *gravidum;* scapo paucifloro apice flexuoso læviusculo, floribus pendulis longipedunculatis clausis, pedicellis lævibus, ovariis fusiformibus maximis verrucosis, labelli trilobi lobis lateralibus linearibus intermedio ovato acuto venis elevatis, columnæ angulis superioribus inflexis.—J. L.

Cœlia macrostachya.

lanceolate, brownish bracts; and mixed with the flowers themselves are many long, narrow, reflexed bracts, whose dull pale brown colour forms a disadvantageous contrast.

In the accompanying sketch a piece of the flower-spike is represented of the natural size, with some magnified details of the structure. 1. Shows the column and lip, seen from the side, the sepals and petals having been removed; 2. Is a view of the slipper-shaped lip, seen from above; 3. Is a front view of the column; and 4, the pollen masses.

It is best treated as the half terrestrial kinds are, and grown in rather a shady part of the house; it requires but little moisture or heat, and a light loose material to grow in.

It is a plant of little value.

15. POLYGONUM BRUNONIS. *Wallich, Plantæ Asiaticæ Rariores*, iii. 54; *Royle's Illustrations*, t. 80, f. 3.

Raised from seeds received, in April, 1845, from Captain William Munro, from the northern parts of India.

This, like P. vacciniifolium, already described at page 80 of the present volume, is a dark-green-leaved trailing half-shrubby plant, with dwarf ascending stems, which bear spikes of rosy flowers; but it is larger in all its parts, and capable of covering considerable patches with its shoots in the course of a single summer. Its stems are as thick as a goose quill, long stalked, lanceolate, a little broader at the end, and when old, marked with prominent veins round the edges, which gives them the appearance of being serrated. The stipules are long, membranous, and convolute, extending into a ribbed lanceolate blade as long as the petiole, but not at all broken up into fringes. The flowers are larger and paler than in P. vacciniifolium; in neither species do they in this country attain the rich red given them in Dr. Royle's plates. Inhabits the mountains of India along with P. vacciniifolium.

A hardy trailing little shrub, well suited for the decoration of rockwork.

Sept. 7, 1847.

XVI.—*Tables of Temperature, for the use of Gardeners; arranged according to the Latitudes of the respective localities in which the Observations have been made.* By Robert Thompson.

The indigenous objects of horticultural care are few, compared with the vast number that are exotic. As to these, the first consideration ought to be their natural climates, especially with reference to temperature, in order to determine, in the first instance, whether they should be treated as hardy, half-hardy, greenhouse, or stove plants; whether they are suited for only a mild and nearly equable temperature, or are adapted for sustaining great extremes of heat and cold. The importance of obtaining correct data for the determination of these points will be readily acknowledged. It is remarked in 'The Theory of Horticulture,' p. 102, that "To collect together evidence as to the real amount of temperature at the different seasons of vegetation, in various parts of the globe, would be to render a most important service to horticulture; for it is hopeless to expect that the cultivation of plants can be perfect, in the absence of one of the first data that require to be ascertained. What, for instance, are the terrestrial and atmospheric temperatures of the melon-fields of Persia, Bokhara, Spain, or Smyrna, where that delicious fruit acquires its greatest excellence?"

In general plants will bear the extremes of heat and cold which occur in their native countries without being killed in consequence of temporary exposure to such vicissitudes; but they may be made to perish gradually by subjecting them to a temperature either constantly above or constantly below the mean temperature of their native climate during the period of vegetation. It therefore becomes desirable to know the mean temperature, not only of the whole year, but also of the respective months in every place from which plants are obtained. This would prevent serious mistakes and losses in many instances; and, although it

does not comprise all that could be wished, yet it would form a good basis.

The larch is now planted as a shelter for the oak, but on its introduction from Italy it was kept in a greenhouse for years. Such unnecessary precautions, it may be said, are now obsolete; but I may be allowed to remark that, in the absence of data for estimating the temperatures of particular localities, much injury may be done, even at the present day. For example: gardeners often receive plants or packets of seeds with no information respecting them, except, perhaps, the name of the country in which they were originally obtained. If from within the tropics, the gardener is apt to conclude that the plant must require to be placed in a stove. Madras is within the tropics, in lat. 13° 4′, its mean temperature about 82°; that of the coldest month, 76½°; and that of the hottest, 87° or 88°; so that a plant from thence is certainly a stove-plant. Another place, called Dodabetta, still nearer the equator, being in lat. 11° 23′, might be supposed to be fully hotter; but there is a wide difference. At Dodabetta the mean temperature of the year is only 52° 17′, being no fewer than 30° below that of Madras. The mean temperature of the hottest month at Dodabetta is 56¼°, and the thermometer in the shade, during two years' observations, never rose above 69°. In the Garden of the Society at Chiswick, the mean temperature of the hottest month averages about 63°; for months the daily maximum averages above 70°; and instead of never exceeding 69°, as at Dodabetta, the temperature in the shade at Chiswick has occasionally exceeded 90°. The climate of Chiswick is, therefore, too hot in summer for plants indigenous to Dodabetta, and these would certainly be killed if confined in a stove.

The discrepancy between the temperatures of Madras and Dodabetta is owing to difference of elevation, Madras being near the level of the sea; whereas Dodabetta is situated on the Neilgherry Hills, at an elevation of 8640 feet. Elevation is so important with regard to temperature, that the impossibility of ascertaining it for insertion for every place in the following

tables is much to be regretted, as this would have led to a tolerably correct estimate of the decrement of temperature due to elevation in the respective parallels of latitude. As it is, the places being arranged according to their latitudes, the contrast thus afforded between the temperatures of places known to be near the level of the sea, and those at ascertained elevations where such occur on nearly the same parallel, will doubtless prove interesting and useful.

The following tables have been drawn up from the Temperature Tables of Professor Dove, of Berlin, published in the Report of the British Association for the Advancement of Science, and from other sources. They exhibit the mean temperature of the months, the mean temperature of the seasons, and of the whole year, the difference of the hottest and coldest months, and that of summer and winter, the number of years in which the observations have been made, and the hours of observation. The seasons are according to the meteorological divisions of the year: winter including the months of December, January, February; spring, those of March, April, May; summer, June, July, August; and autumn, September, October, November. In the column showing the hours of observation, the letters N.Y. indicate that the observations have been reduced by the formula $\text{N.Y.} = \frac{a + 2b + 2c + a'}{6}$, in which a is the observation at 6 A.M., b at 3 P.M., c at one hour after sunset, and a' at 6 A.M. the following day; that is, the temperature observed at 6 A.M., twice the temperature at 3 P.M., twice that at one hour after sunset, and the temperature at 6 A.M. the following day, are added together and divided by 6 for the mean temperature of the twenty-four hours. In other cases, marked "Red.," the observations at particular hours have been reduced to the mean by Bessel's formula. It would have been very desirable, for the sake of comparison, if all the results had been uniformly reduced to the true mean temperature; but the best formulæ to be applied for different countries have not yet been fully agreed upon.

Mean Temperature of each Month.

Lat. 0° 14′ to 11° 25′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Quito . . .	*Peru*	0 14 S.	78 45 W.	8970	58·24	60·98	60·04	59·86	60·62	59·00	59·18	60·94	61·34	59·95	60·53	..
Sincapore . .	*India*	1 17 N.	103 50 E.	..	78·48	80·30	80·40	81·06	81·68	81·56	82·17	81·11	81·04	81·09	80·32	79·94
Bogota . .	*S. Amer.*	4 36 N.	74 14 W.	8100	60·26	60·62	59·54	59·36	59·72	59·18	57·56	61·88	61·16	59·54	59·18	59·00
Elmina . .	*Africa*	5 6 N.	1 20 W.	..	77·	80·	81·	81·	80·	79·	77·	76·	75·	79·	..	..
Cape Coast .	*Africa*	5 8 N.	1 12 W.	..	80·8	80·5	80·5	80·2	79·	78·7	75·8	73·5	73·	76·8	79·5	..
Niger . . .	*Africa*	5 9 N.	..	..	86·	86·	86·	87·98	87·98	89·06	80·06	87·89	88·16	89·02	80·06	80·06
Christiansborg	*Africa*	5 24 N.	0 16 E.	..	81·14	81·73	82·78	83·37	82·96	79·	77·09	75·79	77·95	80·51	81·77	81·03
Guinea . .	*Africa*	5 30 N.	..	..	81·50	83·84	83·66	82·76	82·22	81·68	75·98	78·08	78·98	81·50	81·14	82·22
Commewine .	*S. Amer.*	5 38 N.	54 42 W.	..	78·26	77·18	77·	78·08	78·26	78·08	77·90	78·08	78·26	79·16	78·80	78·80
Paramaribo .	*Surinam*	5 44 N.	55 13 W.	..	78·24	78·01	78·94	79·16	79·88	79·52	80·02	82·	83·44	83·28	81·46	79·66
Batavia . .	*Java*	6 9 S.	106 53 E.	..	78·	79·	79·5	79·	80·	77·5	78·	79·	79·	77·	75·	79·
Rio Berbice .	*S. Amer.*	6 29 N.	56 0 W.	..	78·44	78·62	79·88	80·24	80·78	82·22	83·12	84·38	83·84	84·20	82·76	80·24
Buitenzorg .	*Sumatra*	6 37 S.	106 49 E.	..	75·22	75·58	76·37	76·80	77·16	76·53	76·21	76·80	77·27	77·86	76·80	77·05
Demerara . .	*S. Amer.*	6 45 N.	58 2 W.	..	79·5	81·	81·	80·5	82·	79·	82·	83·	82·	81·	81·	76·5
Colombo . .	*Ceylon*	6 57 N.	80 0 E.	..	79·2	80·4	82·38	84·33	83·8	81·7	80·3	80·6	80·23	79·4	78·75	77·85
Badulla . .	*Ceylon*	7 0 N.	81 20 E.	2107	66·67	68·33	68·33	71·33	72·33	71·00	69·33	72·00	72·33	72·33	71·00	70·50
Candy . .	*Ceylon*	7 17 N.	80 49 E.	1790	70·60	72·52	74·08	73·77	74·58	73·15	72·52	73·32	72·7	72·23	72·07	71·80
Trevandrum .	*India*	8 30 N.	77 0 E.	200	78·93	80·38	82·73	83·37	81·60	79·02	78·45	78·99	79·97	79·07	79·75	78·03
Freetown . .	*Africa*	8 30 N.	13 10 W.	..	82·00	81·00	80·00	80·00	80·00	78·00	78·00	77·00	78·00	78·00	80·00	80·00
Trincomalee .	*Ceylon*	8 34 N.	81 22 E.	..	77·60	76·50	77·40	80·00	82·40	83·80	84·40	83·50	82·70	83·10	79·7	77·90
Ascension .	*Atl. Ocean*	8 45 S.	14 24 W.	..	..	80·13	73·17	72·81	80·82	78·18	76·48	76·74	75·91	75·80	..	..
Cumana . .	*S. Amer.*	10 28 N.	64 15 W.	..	80·35	80·51	81·95	83·84	84·54	83·10	83·28	81·50	..	..	83·21	80·83
Caracas . .	*S. Amer.*	10 31 N.	67 5 W.	2730	69·73	68·02	71·	71·	71·67	72·24	..	..	72·45	73·31	72·54	71·70
Puerto d'España	*S. Amer.*	10 38 N.	61 34 W.	..	76·5	76·5	77·5	78·5	77·5	78·	79·	79·5	79·	78·5	79·	76·5
Maracaybo .	*S. Amer.*	10 43 N.	71 52 W.	..	81·20	83·36	82·83	86·35	85·93	86·60	86·66	86·91	86·42	84·99	83·91	81·87
Dodabetta .	*India*	11 23 N.	76 47 E.	8640	51·50	51·30	54·40	56·25	56·15	50·50	51·15	50·95	51·15	51·85	51·40	49·55
Coburg Peninsula	*Austr.*	11 25 S.	132 15 E.	..	83·72	83·67	85·44	85·15	81·49	78·38	77·53	79·55	80·96	84·70	86·61	86·24
Ootacamund .	*India*	11 25 N.	76 45 E.	7844	53·0	54·8	59·2	62·7	62·2	60·	57·2	57·81	58·0	58·0	56·0	52·5

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Quito . . .	*Peru*	..	60·17	59·71	60·61	..	..	..	2½	. .
Sincapore . .	*India*	79·24	81·05	81·61	80·82	80·68	3·69	2·37	6	6, 12, 6.
Bogota. . .	*S. Amer.*	59·97	59·54	59·54	59·97	59·74	4·32	−0·43	1	9, 4.
Elmina . .	*Africa*	..	80·67	77·33	..	..	..	..	1	8.
Cape Coast .	*Africa*	..	79·90	76·	76·43	..	..	..	1	9, 3.
Niger . . .	*Africa*	84·02	87·32	85·67	84·08	85·27	9·00	1·65	1	3, 9, 3, 9.
Christiansborg	*Africa*	81·30	83·03	77·29	80·08	80·42	7·58	−4·01	4½	Reduced.
Guinea . .	*Africa*	82·52	82·88	79·58	80·54	81·38	7·86	2·94	1⅓	6, 1, 9.
Commewine .	*S. Amer.*	78·08	77·79	78·01	78·73	78·15	2·16	−0·07	2	. .
Paramaribo .	*Surinam*	78·64	79·33	80·51	82·73	80·30	5·43	1·87	2	7, 2, 7.
Batavia . .	*Java*	78·67	79·50	78·17	77·00	78·33	5·00	−0·50	1½	6, 12, 2, 10.
Rio Berbice .	*S. Amer.*	79·10	80·30	83·24	83·60	81·56	5·94	4·14	1	7, 3, 7.
Buitenzorg .	*Sumatra*	75·94	76·78	76·51	77·32	76·64	2·64	0·57	3	6, 9, 3½, 10.
Demerara . .	*S. Amer.*	79·	81·17	81·33	81·33	80·71	6·50	2·33	1½	. .
Colombo . .	*Ceylon*	79·15	83·50	80·87	79·46	80·75	6·48	1·72	1	7, 3.
Badulla . .	*Ceylon*	68·50	70·66	70·78	71·89	70·46	50·66	2·28	1	8, 12, 8.
Candy . . .	*Ceylon*	71·64	74·14	73·00	72·33	72·78	3·98	1·36	3	Daily extremes.
Trevandrum .	*India*	79·11	82·57	78·82	79·60	80·02	2·35	−0·29	3	Daily extremes.
Freetown . .	*Africa*	81·00	80·00	77·67	78·67	79·33	5·00	−4·67	..	. .
Trincomalee .	*Ceylon*	77·33	79·93	83·90	81·85	80·75	7·90	6·75	2	6, 3, 9.
Ascension .	*Atl. Ocean*	..	75·60	77·13	..	...	8·01	..	8/4	9, 3, 9.
Cumana . .	*S. Amer.*	80·56	83·44	82·63	..	..	..	2·07	1	. .
Caracas . .	*S. Amer.*	69·82	71·22	..	72·77	..	..	..	1	6, 7, 2, 3.
Puerto d'España	*S. Amer.*	76·5	77·83	78·83	78·83	78·00	3·00	2·33	1	. .
Maracaybo .	*S. Amer.*	82·14	85·04	86·72	85·11	84·75	5·71	4·58	1	7, 3.
Dodabetta . .	*India*	50·78	55·60	50·87	51·47	52·17	6·70	−0·09	1	Daily extremes.
Coburg Peninsula	*Austr.*	84·54	84·03	78·48	84·09	82·79	+9·08	−6·06	1½	. .
Ootacamund .	*India*	53·43	61·37	58·43	57·33	57·64	10·20	5·00	2½	Daily extremes.

Mean Temperature of each Month.

Lat. 11° 25′ to 17° 59′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Fort Dundas .	*Australia*	11 25 S.	132 25 E.	..	83·66	83·12	82·94	82·40	80·60	77·36	72·14	76·10	78·80	82·04	83·66	84·74
Rio de la Hacha	*S. Amer.*	11 28 N.	73 00 W.	..	81·32	81·83	84·25	81·5	84·3	84·38	..	..	..	..	..	81·70
Anjarakandy .	*India*	11 40 N.	75 40 E.	..	79·7	81·9	83·5	85·6	83·7	79·8	78·4	79·1	79·6	80·7	80·6	80·2
Pondichery .	*India*	11 56 N.	79 52 E.	..	79·7	83·	88·	91·5	94·	95·4	93·8	92·	89·5	85·	81·2	80·3
Lima . . .	*S. Amer.*	12 3 S.	77 8 W.	530	78·08	79·88	80·06	77·36	77·90	68·36	68·54	67·28	66·20	69·26	71·96	74·84
Curaçao . .	*W. Indies*	12 6 N.	69 20 W.	..	77·90	78·62	78·62	80·24	80·96	81·86	..	..	..	..	81·14	72·68
Mercara . .	*India*	12 26 N.	75 50 E.	4796	66·6	70·8	73·7	73·1	71·9	69·1	67·1	66·	65·6	66·8	66·5	64·4
Seringapatam .	*India*	12 45 N.	76 51 E.	2412	69·	74·	79·7	83·	83·5	77·7	73·2	74·	75·5	76·5	72·	71·
Bangalore . .	*India*	12 58 N.	77 37 E.	3000	69·50	72·50	78·75	78·50	78·50	75·25	73·75	73·25	73·75	70·50	71·37	69·25
Barbadoes . .	*W. Indies*	13 4 N.	59 37 W.	..	76·11	..	..	..	79·77	80·40	80·05	80·63	79·58	79·72	79·86	76·79
Madras . .	*India*	13 4 N.	80 19 E.	..	75·17	77·16	79·92	82·42	86·92	88·16	85·65	84·73	83·83	81·86	78·67	78·84
Do.	Do.	,,	,,	..	76·77	78·24	82·23	85·74	87·10	87·02	86·23	84·51	83·48	81·18	78·54	76·55
Kingstown, St. V.	*W. Indies*	13 8 N.	61 10 W.	..	78·52	78·06	78·12	79·69	81·53	81·19	81·18	81·79	81·10	81·40	80·62	79·81
St. Vincent .	*W. Indies*	13 10 N.	61 9 W.	..	79·98	79·27	79·72	81·26	82·22	82·15	82·21	82·81	83·34	82·70	82·14	80·40
Kouka . . .	*Africa*	13 10 N.	14 30 E.	..	75·74	83·12	88·88	92·30	91·04	89·60	83·66	80·42	83·30	85·28	79·70	70·52
Cobbe . . .	*Africa*	14 11 N.	28 8 E.	..	67·10	67·28	80·60	86·54	87·44	87·08	87·80	87·08	86·72	83·12	78·08	72·68
Guatemala .	*America*	14 36 N.	90 28 W.	4391	65·98	65·8	68·96	71·25	70·42	71·11	69·3	69·13	68·88	68·71	67·19	66·2
Manilla . .	*Phil. Isles*	14 36 N.	120 57 E.	..	70·	68·	72·	75·	75·	87·	87·	87·	84·	84·	82·	70·
Rosseau . .	*W. Indies*	15 18 N.	61 22 W.	..	76·	74·	77·	77·	79·	81·	81·	80·	80·	80·	75·	..
St. Helena .	*Atl. Ocean*	15 55 S.	5 43 W.	1764	63·98	65·87	66·24	65·60	63·05	60·07	57·99	57·17	57·07	58·23	59·84	61·77
Darwar . .	*India*	16 28 N.	75 11 E.	2558	70·16	74·71	77·22	80·42	80·27	74·78	72·90	72·65	..	..	..	..
Raiatea . .	*Polynesia*	16 40 S.	156 16 W.	..	78·73	80·67	80·90	79·43	78·4	78·4	75·7	77·83	77·43	77·93	77·53	79·2
Antigua . .	*W. Indies*	17 8 N.	61 48 W.	..	77·45	76·55	76·65	77·85	80·05	80·45	80·95	81·9	81·5	80·85	81·85	79·1
Belize . . .	*America*	17 30 N.	88 5 W.	..	75·	78·	78·	80·	81·	82·	82·	82·	82·	81·	79·	75·
St. Christopher	*W. Indies*	17 44 N.	62 49 W.	..	78·02	78·13	80·09	80·32	81·46	83·28	84·19	83·89	83·48	82·40	81·27	78·73
St. Bartholomew	*W. Indies*	17 53 N.	63 0 W.	..	79·05	78·69	79·99	80·06	79·86	79·59	83·30	81·01	79·18	80·17	79·48	79·32
Up Park Camp	*W. Indies*	17 58 N.	76 50 W.	200	78·	78·	82·	83·	81·	82·	83·	82·	82·	80·	79·	77·5
Mahabaleshwar	*India*	17 59 N.	73 30 E.	4796	65·7	67·5	74·0	74·4	73·9	66·3	64·9	65·3	65·0	65·5	63·5	62·3

Mean Temperature of each Season, and the whole Year.

	Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
	°	°	°	°	°	°	°		
Fort Dundas . *Australia*	83·84	81·98	75·20	81·50	80·63	12·60	—8·64	1	6, 8, 12, 3, 9, 12.
Rio de la Hacha *S. Amer.*	81·62	83·35	..	..	..	..	..	..	7, 3.
Anjarakandy . *India*	80·60	84·27	79·10	80·30	81·07	7·20	—1·50	10	..
Pondichery . *India*	81·	91·17	93·73	85·23	87·78	15·70	12·73	1	..
Lima . . . *S. Amer.*	77·60	78·44	68·06	69·14	73·31	13·86	—9·54	2	12.
Curaçao . . *W. Indies*	76·40	79·94	..	..	..	..	..	..	5, 12, 9.
Mercara . . *India*	67·27	72·90	67·40	66·30	68·47	9·30	0·13	3	Daily extremes.
Seringapatam . *India*	71·33	82·07	74·97	74·67	75·76	14·50	3·64	1	Sunrise, $2\frac{1}{2}$.
Bangalore . . *India*	70·42	78·58	74·08	71·87	73·74	9·50	3·66	1	2 hourly.
Barbadoes . . *W. Indies*	..	..	80·36	79·72	..	4·52	..	1	18 times.
Madras . . *India*	77·06	83·09	86·18	81·45	81·94	12·99	9·12	20	Reduced.
Do. Do.	77·18	85·02	85·92	81·07	82·30	10·55	8·74	5	Hourly.
Kingstown, St. V. *W. Indies*	78·80	79·78	81·39	81·04	80·25	3·73	2·59	..	..
St. Vincent . *W. Indies*	79·88	81·07	82·39	82·73	81·52	4·07	2·51	6	..
Kouka . . . *Africa*	76·46	90·74	84·56	82·76	83·63	21·78	8·10	2	..
Cobbe . . . *Africa*	69·01	84·85	87·33	82·65	80·96	20·70	18·32	2	7, 2.
Guatemala . *America*	65·99	70·21	69·85	68·26	68·58	5·45	3·86	1	8, 12, 4.
Manilla . . *Phil. Isles*	69·33	74·	87·	83·33	78·42	19·	17·67	1	..
Rosseau . . *W. Indies*	..	77·67	80·67	78·33	..	..	..	..	..
St. Helena . *Atl. Ocean*	63·87	64·96	58·41	58·38	61·40	9·17	—5·46	5	2 yrs. 2 hrly; 3 yrs. hrly.
Darwar . . *India*	..	79·30	73·44	..	..	..	..	1	10, 10.
Raiatea . . *Polynesia*	79·53	79·58	77·31	77·63	78·51	5·20	—2·22	1	3 times.
Antigua . . *W. Indies*	77·7	78·18	81·1	81·4	79·6	5·35	3·40	1	..
Belize . . . *America*	76·	79·67	82·	80·67	79·58	7·0	6·0	1	..
St. Christopher *W. Indies*	78·29	80·62	85·79	82·38	81·27	6·17	5·50	$1\frac{1}{3}$	Daily extremes.
St. Bartholomew *W. Indies*	79·03	79·97	81·30	79·61	79·97	4·61	2·27	1	$\frac{1}{4}(6+12+2)$.
Up Park Camp *W. Indies*	77·83	82·	82·33	80·33	80·63	5·50	4·50	..	..
Mahabaleshwar *India*	66·17	74·10	65·50	64·67	67·36	12·10	0·33	1	Daily extremes.

Mean Temperature of each Month.

Lat. 18° 0′ to 24° 31′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Kingston .	. *Jamaica*	18 0 N.	77 0 W	..	75·73	76·	75·87	78·08	80·27	80·6	81·67	81·	80·73	79·8	78·73	76·74
St. Antonio	. *Jamaica*	18 20 N.	76 20 W.	..	75·6	74·6	74·75	75·1	77·25	79·45	79·75	79·4	80·4	79·45	78·7	75·4
St. Thomas	. *W. Indies*	18 21 N.	64 56 W.	..	79·30	79·02	78·21	80·67	80·67	82·65	82·76	82·87	83·69	82·06	81·54	81·30
Tortola .	. *W. Indies*	18 27 N.	64 40 W.	860	77·35	77·	76·09	78·39	78·56	80·79	80·84	81·96	81·	80·95	80·02	79·85
Domingo .	. *W. Indies*	18 29 N.	70 0 W.	..	85·17	84·04	85·17	86·	85·50	82·06	78·69	77·	78·69	78·69	77·83	78·69
Puerto Rico	. *W. Indies*	18 29 N.	66 13 W.	..	77·33	78·83	75·33	80·33	81·33	84·	87·33	89·33	83·67	81·33	79·67	78·00
Tivoli . .	. *W. Indies*	18 35 N.	70 0 W.	..	69·08	68·90	71·60	73·40	72·50	78·08	77·90	77·	77·	74·71	73·58	70·88
Bombay .	. *India*	18 56 N.	72 54 E.	..	76·30	78·07	79·68	84·20	85·86	85·37	82·05	81·11	81·17	82·54	80·90	77·95
Vera Cruz	. *Mexico*	19 12 N.	96 9 W.	..	69·98	71·60	73·40	77·18	80·42	81·86	81·50	82·40	80·96	78·44	75·38	71·06
Mexico .	. —	19 25 N.	99 6 W.	6990	52·50	56·37	61·14	62·98	66·15	65·39	65·35	64·94	64·31	60·22	55·85	52·05
Poonah .	. *India*	18 25 N.	74 6 E.	1943	70·66	73·70	74·12	81·97	82·27	80·79	77·41	77·13	77·11	79·14	76·42	70·57
Tlalpujahua	. *Mexico*	19 48 N.	100 5 W.	7870	53·78	56·71	60·13	62·73	66·20	65·17	63·01	62·42	58·64	59·67	58·64	54·12
Gongo Soco	. *S. Amer.*	19 59 S.	43 30 W.	3360	71·07	71·25	70·2	68·65	65·75	60·2	59·52	63·81	61·67	70·60	72·19	72·2
Port Louis	. *Maurit.*	20 10 S.	57 30 E.	32	81·96	81·66	82·66	82·63	77·20	76·50	73·93	74·60	75·70	76·43	79·20	81·86
Nagpoor .	. *India*	21 8 N.	79 11 E.	..	71·36	74·87	84·26	93·00	96·27	86·03	81·00	81·14	81·52	81·56	73·37	72·65
Honolulu .	. *Polynesia*	21 16 N.	157 59 E.	..	70·52	71·96	71·24	73·58	75·56	77·18	77·00	78·80	77·90	77·36	75·20	72·50
Ava . .	. *India*	21 50 N.	96 5 E.	..	64·69	73·49	75·59	86·19	83·99	85·49	82·79	82·49	82·69	80·59	74·19	68·29
Macao . .	. *China*	22 11 N.	113 34 E.	..	62·	54·95	64·30	71·34	78·45	82·73	82·87	83·09	81·59	76·11	67·44	61·16
San Fernando	. *W. Indies*	22 20 N.	73 51 W.	..	66·9	68·9	73·2	74·6	77·9	78·9	80·5	79·6	78·6	75·9	72·7	67·9
Calcutta .	. *India*	22 35 N.	88 20 E.	80	69·28	75·10	83·51	88·90	90·39	88·65	85·89	85·61	86·05	84·41	78·73	72·36
Veta Grande	. *Mexico*	22 50 N.	102 25 W.	8030	49·06	51·35	57·65	60·13	63·37	63·52	60·31	59·49	58·62	58·37	55·44	52·
Rio Janeiro	. *Brazil*	22 54 S.	43 16 W.	32	80·13	80·04	77·95	75·47	70·68	68·68	67·15	69·96	70·48	72·82	74·39	77·27
Ubajay .	. *W. Indies*	23 0 N.	82 0 W.	290	64·5	67·5	66·88	70·	76·13	82·25	83·63	83·25	79·63	76·5	69·25	62·38
Metanzas .	. *Cuba*	23 2 N.	81 38 W.	110	73·53	72·11	75·76	80·24	80·75	82·09	81·53	80·63	82·15	78·80	77·71	74·68
Canton .	. *China*	23 8 N.	113 16 E.	..	52·5	55·	62·5	70·	77·	81·	83·	82·	80·03	73·25	65·20	57·13
Havannah .	. *Cuba*	23 9 N.	82 23 W.	..	71·38	74·03	74·08	76·62	77·97	81·01	81·46	81·57	80·38	78·85	75·13	73·54
Bancoora .	. *India*	23 30 N.	87 12 E.	..	67·01	71·51	78·82	85·19	88·00	85·44	82·51	82·21	81·73	80·19	74·07	68·88
Key West .	. *W. Indies*	24 31 N.	81 53 W.	..	69·46	70·01	72·60	75·22	78·87	81·26	82·53	82·67	81·32	77·44	74·71	70·52

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Kingston .	. *Jamaica*	76·16	78·07	81·09	79·75	78·77	5·94	4·93	5	Sunrise, 1—2.
St. Antonio	. *Jamaica*	75·2	75·7	79·53	79·52	77·49	5·80	4·33	2	Sunrise, 12.
St. Thomas	. *W. Indies*	79·87	79·85	82·76	82·43	81·23	5·48	2·89	1	6, 7, 4, 8.
Tortola .	. *W. Indies*	78·07	77·68	81·20	80·66	79·40	5·87	3·13	3	6, 2, 6.
Domingo .	. *W. Indies*	82·63	84·89	79·25	78·40	81·29	9·00	—3·38	1	. .
Puerto Rico	. *W. Indies*	78·05	79·	86·89	81·56	81·38	14·	8·84	5	7, 12, 5.
Tivoli . .	. *W. Indies*	69·62	72·50	77·66	75·10	73·72	9·18	8·04	1	. .
Bombay .	. *India*	77·44	83·25	82·84	81·54	81·27	9·56	5·40	1⅓	Hourly.
Vera Cruz	. *Mexico*	70·88	77·	81·92	78·26	77·02	12·42	11·04	13	. .
Mexico .	. —	53·64	63·42	65·23	60·13	60·60	38·02	34·72	1	7, 3, 11.
Poonah .	. *India*	71·64	79·45	78·44	77·56	76·77	11·70	6·80	5	Sunrise, 4.
Tlalpujahua	. *Mexico*	54·87	63·02	63·53	58·98	60·10	12·42	8·66	1	8, 2, 6½.
Gongo Soco	. *S. Amer.*	71·51	68·20	61·18	69·02	67·48	..	..	1	6, 9, 12, 4, 6, 8, 12.
Port Louis	. *Maurit.*	81·83	80·83	75·01	77·11	78·69	8·73	—6·82	3	. .
Nagpoor .	. *India*	72·96	91·18	82·72	79·48	81·59	24·91	9·76	3	Sunrise, 8, 3, sunset.
Honolulu .	. *Polynesia*	71·66	73·46	77·66	76·82	74·90	8·28	6·00	2⅓	7, 2, 10.
Ava . .	. *India*	68·82	81·92	83·59	79·16	78·39	71·50	14·77	1	. .
Macao . .	. *China*	59·37	71·36	82·90	75·05	72·17	28·14	23·53	4	6, 4.
San Fernando	. *W. Indies*	67·9	75·23	79·67	75·73	74·63	13·60	11·77	1	8.
Calcutta .	. *India*	72·25	87·60	86·72	83·06	82·41	21·11	14·47	4	10, 4.
Veta Grande	. *Mexico*	50·80	60·38	61·11	57·48	57·44	14·46	10·31	2	8½, 4½.
Rio Janeiro	. *Brazil*	79·15	74·70	68·60	72·56	73·75	12·98	10·55	7	Reduced.
Ubajay .	. *W. Indies*	64·79	71·	83·04	71·79	72·66	21·25	18·25	4	7, 12, 10.
Metanzas .	. *Cuba*	73·44	78·92	81·42	79·55	78·33	9·98	7·98	2	Sunr. 2, suns. daily extremes.
Canton .	. *China*	54·88	69·83	82·00	72·83	69·88	30·50	27·12	10	. .
Havannah	. *Cuba*	72·98	76·22	81·35	78·12	77·17	10·19	8·37	7	. .
Bancoora .	. *India*	69·13	84·00	83·39	78·66	78·80	20·99	14·26	2	10, 10.
Key West .	. *W. Indies*	70·00	75·56	82·15	77·82	76·38	13·21	12·15	7	Sunr. 2, 10, daily extremes.

Mean Temperature of each Month.

Lat. 25° 9′ to 29° 50′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Chunar .	. India	25 9 N.	82 54 E.	319	58·	62·5	77·5	84·	89·	88·	90·	85·5	82·25	79·75	69·50	63·25
Nassau .	. Bahamas	25 16 N.	77 48 W.	..	69·	73·	76·	78·	79·	83·	87·	88·	87·	80·	74·	70·
Do.	Do.	,,	,,	24	73·08	70·00	70·75	72·75	76·50	80·85	82·75	83·20	80·20	78·94	75·32	70·99
Benares .	. India	25 18 N.	82 56 E.	319	62·56	72·49	79·07	89·91	94·35	90·28	85·71	85·72	85 99	81·49	72·13	63·45
Mozufferpur	. India	26 7 N.	83 24 E.	..	56·79	64·60	73·59	81·59	86·90	86·43	84·35	83·08	82·57	78·17	67·52	60·90
Nassirabad	. India	26 18 N.	74 45 E.	1598	59·2	62·7	71·8	82·6	90·4	90·1	85·7	82·7	82·5	78·8	68·5	58·2
Cawnpore .	. India	26 29 N.	80 22 E.	532	63·8	69·5	72·15	88·55	96·5	91·23	86·65	87·4	85·03	78·95	75·25	67·5
Tirhoot .	. India	26 33 N.	85 24 E.	..	60·4	66·7	76·1	85·2	89·2	86·7	84·5	85·0	81·5	73·8	..	67·6
Nazera .	. India	26 52 N.	94 45 E.	..	61·44	64·23	68·02	72·05	78·41	81·50	82·75	81·98	81·73	77·12	67·42	60·44
Futtehgur .	. India	27 2 N.	79 30 E.	639	57·3	63·2	74·4	85·1	90·2	95·	87·25	85·1	84·15	75·4	68·8	58·0
Darjiling .	. India	27 7 N.	88 24 E.	7414	43·4	45·5	55·7	60·2	60·	64·5	63·5	63·5	62·3	60·5	53·5	47·6
Khatmandu	. India	27 42 N.	85 18 E.	4955	48·1	51·5	56·2	64·5	71·63	74·4	76·3	74·1	72·02	64·58	55·4	46·28
Fort Brook	. N. Amer.	27 57 N.	82 35 W.	..	63·08	65·78	68·56	72·79	77·99	80·79	81·74	81·23	79·95	75·23	69·06	64·42
Bareilly .	. India	28 0 N.	79 0 E.	..	56·5	64·25	72·	85·5	83·15	90·75	86·5	84·25	81·	76·75	66·5	58·25
Las Palmas	. Canaries	28 20 N.	15 30 W.	..	61·93	63·64	64·76	66·31	68·23	70·30	73·63	76·21	80 69	84·11	71·96	63·37
Do.	Do.	,,	,,	..	62·00	63·50	64·70	66·90	68·20	70·20	73·6	76·10	80·70	84·10	72·90	63·30
Laguna .	. Canaries	28 30 N.	16 19 W.	1630	55·25	56·	58·13	59·13	62·	65·	68·88	71·	70·	66·19	62·	58·
Santa Cruz	. Canaries	28 49 N.	16 14 W.	..	63·84	64·29	67·17	67·32	72·12	73·89	77·29	78·89	77·43	74·66	70·43	66·42
Surrowlee .	. India	28 50 N.	77 20 E.	600	50·66	57·14	66·43	75·62	81·01	85·70	85·11	83·29	77·93	70·72	58·29	50·48
Abusheher	. Persia	29 1 N.	50 54 E.	..	61·52	64·84	67·28	74·30	82·94	89·78	93·74	92·48	88·52	81·32	69·08	59·72
Saharunpore	. India	29 5 N.	77 31 E.	1078	52·	55·	67·	78·	85·	90·	85·	83·	79·	74·	64·	55·
Fort King	. U. States	29 12 N.	82 12 W.	..	60·81	65·28	65·56	73·31	78·81	84·94	84·03	83·63	81·52	72·81	61·98	59·25
Galveston .	. U. States	29 18 N.	95 1 W.	..	60·3	62·5	75·0	73·2	83·5	86·3	88·2	88·5	87·1	64·2	60·1	59·4
Lohooghat	. India	29 23 N.	82 16 E.	5800	44·53	45·78	52·34	60·49	65·99	71·44	71·34	70·56	68·76	63·50	51·92	49·42
Do.	Do.	,,	,,	5800	45·17	43·57	52·34	59·32	66·59	68·41	69·34	69·10	67·32	63·17	52·25	47·29
Fort St. Philip	U. States	29 29 N.	89 21 W.	..	52·94	51·59	64·09	70·35	77·24	84·31	81·53	82·83	79·48	71·43	67·35	57·71
Hawul Bagh	. India	29 40 N.	70 37 E.	3887	41·	46·	53·5	60·	65·	74·5	75·	75·5	66·	62·	51·	43·
St. Augustin	. U. States	29 50 N.	81 27 W.	..	60·73	64·97	67·55	70·06	76·89	81·41	82·81	82·67	80·16	73·83	63·55	60·92

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Chunar .	. *India*	61·25	83·50	87·83	77·17	77·44	32·	26·58	1	4 times.
Nassau .	. *Bahamas*	70·67	77·67	86·	80·33	78·67	19·	15·33	1	. .
Do.	Do.	71·35	73·33	82·26	78·15	76·27	13·20	10·91	2	Daily extremes.
Benares .	. *India*	66·17	87·78	87·24	79·87	80·26	31·79	21·07	3	. .
Mozufferpur	. *India*	60·67	80·69	84·62	76·09	75·54	30·11	23·86	3½	Daily extremes.
Nassirabad	. *India*	60·03	81·60	86·17	76·60	76·10	32·20	26·14	4	Sunrise, 2½.
Cawnpore .	. *India*	66·93	85·73	88·43	79·74	80·21	32·70	21·50	1⅓	10, 4.
Tirhoot .	. *India*	62·90	83·50	85·40	. .	. .	28·80	22·50	1	Daily extremes.
Nazera .	. *India*	62·04	72·83	82·08	75·42	73·04	22·31	20·04	3	Sunrise, 2, sunset.
Futtehgur .	. *India*	59·50	83·23	89·12	76·12	76·99	37·70	29·62	1½	. .
Darjiling .	. *India*	45·50	58·63	63·83	58·77	56·68	21·10	18·33	1	4, evening.
Khatmandu	. *India*	48·63	64·11	74·93	64·	62·92	30·02	26·30	2	7, 2.
Fort Brook	. *N. Amer.*	64·43	73·11	81·25	74·75	73·39	18·66	16·82	5	7, 2, 9.
Bareilly .	. *India*	59·67	80·22	87·17	74·75	75·45	34·25	27·50	1	Sunrise, 12.
Las Palmas	. *Canaries*	62·98	66·43	73·38	78·92	70·43	22·18	10·40	1	12, reduced.
Do.	Do.	62·93	66·60	73·30	79·23	70·51	22·10	10·37	10	12, reduced.
Laguna .	. *Canaries*	56·42	59·75	68·29	66·06	62·63	15·75	11·87	8	3 times.
Santa Cruz	. *Canaries*	64·85	68·87	76·68	74·17	71·15	15·05	11·83	2½	Sunrise, 12.
Surrowlee .	. *India*	53·09	74·35	84·70	68·98	70·28	35·04	29·91	4⅔	Sunrise, (daily extremes.)
Abushehr	. *Persia*	61·77	74·84	92·01	79·63	77·07	34·02	30·24	1	. .
Saharunpore	. *India*	54·00	76·67	86·	72·33	72·25	38·	32·	2	. .
Fort King	. *U. States*	61·78	72·56	84·20	72·10	72·66	25·69	22·42	3	7, 2, 9.
Galveston .	. *U. States*	60·73	77·23	87·67	70·47	74·03	29·10	26·94	1	. .
Lohooghat	. *India*	46·58	59·61	71·11	61·39	59·67	26·91	24·53	2	. .
Do.	Do.	45·34	59·41	68·95	60·90	58·65	25·77	23·61	1	Daily extremes.
Fort St. Philip	*U. States*	54·08	70·56	82·89	72·75	70·07	32·72	28·81	1	7, 2, 9.
Hawul Bagh	. *India*	43·33	59·50	75·	59·67	59·38	34·50	31·67	1	7, 2.
St. Augustin	. *U. States*	62·21	71·50	82·30	72·51	72·13	22·08	20·09	4	7, 2, 9.

Mean Temperature of each Month.

Lat. 29° 58′ to 32° 20′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
New Orleans .	*U. States*	29 58 N.	90 7 W.	··	56·75	58·39	66·58	72·41	77·26	81·78	82·22	82·12	79·42	69·71	58·71	52·26
Kulsea . .	*India*	30 0 N.	77 30 E.	1171	58·26	61·03	62·61	77·73	81·23	85·99	83·66	80·35	77·18	70·98	63·18	59·68
Cairo . . .	*Egypt*	30 2 N.	31 15 E.	··	58·10	56·12	64·58	77·90	78·26	83·66	85·82	85·82	79·16	72·32	62·96	61·34
Petit Coquille	*U. States*	30 10 N.	89 38 W.	··	55·98	60·12	63·56	70·00	76·35	82·95	83·95	83·47	80·58	72·12	62·09	61·68
Mobile . .	*U. States*	30 12 N.	87 59 W.	··	56·40	57·37	65·64	70·00	76·36	82·17	82·41	82·73	78·94	69·97	61·50	55·50
Canton Clinch	*U. States*	30 24 N.	87 14 W.	··	54·36	55·98	62·92	68·62	76·24	81·50	82·96	82·27	78·35	70·27	61·13	58·07
Ambala . .	*India*	30 25 N.	76 45 E.	1065	51·4	60·2	70·5	80·85	100·	96·33	84·8	86·	84·1	75·2	64·3	56·85
Chusan . .	*China*	30 25 N.	121 44 E.	··	40·5	38·75	··	··	··	··	··	··	77·7	68·25	57·5	43·5
Baton Rouge .	*U. States*	30 26 N.	91 18 W.	··	52·37	51·86	61·55	68·99	76·58	82·9	80·1	82·04	76·58	66·84	62·47	55·89
Mossouree . .	*India*	30 27 N.	78 2 E.	6496	39·	39·5	52·	60·	72·5	73·	65·5	65·5	61·5	60·5	52·	40·
Ferdinandina .	*U. States*	30 37 N.	81 47 W.	··	55·	65·	64·	72·	74·	78·	80·	79·	80·	69·	64·	61·
Fort Scott . .	*U. States*	30 43 N.	90 12 W.	··	55·	61·	66·	63·	74·	78·	79·	80·	75·	70·	60·	59·
Jackson . .	*U. States*	30 51 N.	91 1 W.	··	47·6	49·4	56·6	65·4	70·8	78·7	81·7	79·9	75·1	67·4	50·	48·4
Caineville .	*India*	31 0 N.	78 0 E.	6691	··	··	··	··	··	69·10	67·35	67·40	66·35	60·41	55·60	··
Rampoor . .	*India*	31 0 N.	77 30 E.	3621	48·7	41·6	50·1	··	··	··	··	··	··	··	58·	52·7
Simla . . .	*India*	31 6 N.	77 11 E.	7486	··	··	··	··	73·95	70·	67·15	67·2	66·3	60·4	55·6	··
Soobathoo . .	*India*	31 6 N.	77 9 E.	4749	··	··	63·45	79·45	··	··	··	··	··	··	··	52·7
Kotgurh . .	*India*	31 19 N.	77 29 E.	7070	40·30	45·30	··	··	67·60	71·45	71·	66·85	64·85	55·80	50·90	··
Brery . . .	*India*	31 19 N.	77 30 E.	8242	39·1	38·6	49·8	49·4	··	··	··	··	··	··	··	··
Cantop Jesup .	*U. States*	31 30 N.	93 47 W.	··	52·30	54·09	61·79	66·81	75·20	80·95	83·54	82·96	77·14	68·29	58·55	53·17
Natchez . .	*U. States*	31 34 N.	91 25 W.	180	50·13	50·89	62·20	69·93	72·72	80·62	81·78	80·13	74·99	65·48	55·23	49·09
Jerusalem . .	*Palestine*	31 47 N.	35 14 E.	2500	47·72	53·73	60·01	54·70	66·79	71·74	77·34	72·55	72·24	68·42	58·93	47·38
York . . .	*Australia*	31 53 S.	116 40 E.	··	84·5	81·	71·5	63·5	58·	49·	52·5	52·	59·	65·5	69·	78·5
Fort Houston .	*U. States*	31 54 N.	95 56 W.	··	65·2	60·5	68·7	72·7	85·5	80·1	84·2	81·4	83·5	72·3	62·3	60·0
Perth . . .	*W. Austr.*	31 56 S.	115 50 E.	··	78·72	79·08	75·25	69·87	63·12	57·75	55·03	58·53	61·06	63·82	69·06	77·18
Savannah . .	*U. States*	32 5 N.	81 10 W.	··	52·15	53·74	61·19	67·36	73·14	77·89	82·23	82·09	75·96	66·92	57·20	50·50
Graf Reynet .	*S. Africa*	32 11 S.	26 0 E.	1171	71·29	69·44	64·27	63·61	59·27	53·78	55·20	55·83	59·86	55·72	67·96	69·98
Bermuda .	*Atl. Ocean*	32 20 N.	64 50 W.	··	56·84	58·82	59·36	62·78	69·08	73·22	75·74	76·64	76·82	73·04	65·84	60·62

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
New Orleans .	*U. States*	55·80	72·08	82·04	69·28	69·80	29·96	26·24	3	8, 2, 8.
Kulsea . .	*India*	59·66	73·86	83·33	70·45	71·82	27·73	23·67	$1\frac{2}{3}$	Daily.
Cairo . . .	*Egypt*	58·52	73·58	85·10	71·48	72·17	29·70	26·58	1	. .
Petit Coquille	*U. States*	59·26	69·97	83·46	71·60	71·07	27·97	24·20	4	7, 2, 9.
Mobile . .	*U. States*	56·42	70·67	82·44	70·14	69·92	27·23	26·07	$2\frac{3}{4}$	7, 2, 9.
Canton Clinch	*U. States*	56·14	69·26	82·24	69·92	69·39	28·60	26·10	7	7, 2, 9.
Ambala . .	*India*	56·15	83·78	89·04	74·53	75·88	48·60	32·89	1	10, 10.
Chusan . .	*China*	..	..	..	..	..	..	..	$\frac{1}{2}$	9, 9.
Baton Rouge .	*U. States*	53·37	69·04	81·68	68·63	68·18	31·04	28·31	1	7, 2, 9.
Mossouree . .	*India*	39·50	61·50	68·	58·	56·75	34·	28·50	..	. .
Ferdinandina .	*U. States*	60·33	70·	79·	71·	70·08	25·	18·67	1	7, 2, 9.
Fort Scott . .	*U. States*	58·33	67·67	79·	68·33	68·33	25·	20·67	1	7, 2, 9.
Jackson . .	*U. States*	48·47	64·27	80·10	64·17	64·25	34·0	31·63	3	Daily extremes.
Caineville . .	*India*	..	..	67·95	60·79	..	..	..	..	10, 10.
Rampoor . .	*India*	47·67	..	..	..	..	..	..	..	. .
Simla . . .	*India*	..	..	68·12	60·77	..	..	..	..	10, 10.
Soobathoo . .	*India*	..	..	..	..	..	..	..	..	. .
Kotgurh . .	*India*	..	..	69·77	57·18	..	..	31·15	$1\frac{1}{4}$	. .
Brery . . .	*India*	..	..	..	..	..	..	..	..	. .
Cantop Jesup .	*U. States*	53·19	67·93	82·48	67·99	67·90	31·24	29·29	8	7, 2, 9.
Natchez . .	*U. States*	50·04	68·28	80·84	65·23	66·10	32·69	30·80	6	6, 6.
Jerusalem . .	*Palestine*	49·61	60·50	73·88	66·53	62·63	29·96	24·27	1	Sunrise, 2, 9.
York . . .	*Australia*	81·33	64·33	51·17	64·50	65·33	35·50	—30·16	1	. .
Fort Houston .	*U. States*	61·90	75·63	81·90	72·70	73·03	25·50	20·00	1	. .
Perth . . .	*W. Austr.*	78·33	69·41	57·20	64·64	67·39	23·69	21·13	4	7, 2, 7.
Savannah . .	*U. States*	52·13	67·23	80·74	66·69	66·70	31·73	28·61	7	7, 2, 7.
Graf Reynet .	*S. Africa*	70·24	62·38	54·94	61·18	62·18	17·51	—15·30	1	6, 7, 1, 7—8.
Bermuda .	*Atl. Ocean*	58·76	63·74	75·20	71·90	67·40	19·98	16·44	1	. .

Mean Temperature of each Month.

Lat. 32° 24′ to 35° 54′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Vicksburg .	*U. States*	32 24 N.	91 6 W.	. .	51·40	53·72	63·99	74·01	76·84	80·65	82·48	80·11	76·40	64·92	55·26	50·91
Funchal . .	*Madeira*	32 38 N.	16 56 W.	80	63·50	63·14	64·22	64·40	64·76	68·72	72·50	73·58	73·94	71·06	67·64	63·86
Fort Moultrie .	*U. States*	32 42 N.	79 56 W.	. .	50·73	46·24	59·00	65·47	74·92	78·86	81·99	79·96	76·19	67·32	57·56	52·81
Milledgeville .	*U. States*	33 7 N.	83 20 W.	. .	48·	45·	57·	65·	. .	82·	87·	86·	79·	. .	. .	. .
Zwartland . .	*S. Africa*	33 20 S.	18 35 E.	. .	75·27	76·99	74·89	68·09	62·18	58·1	57·72	56·98	60·33	63·42	70·35	71·89
Bagdad . .	*Turkey*	33 21 N.	44 22 E.	. .	48·65	55·63	63·50	74·75	86·90	92·08	93·20	94·10	87·35	77·00	67·10	44·60
Augusta . .	*U. States*	33 28 N.	81 54 W.	. .	45·69	47·63	53·66	62·34	69·38	77·72	79·47	75·95	72·96	60·35	54·23	43·45
Uitenhague .	*S. Africa*	33 45 S.	25 20 E.	. .	69·56	70·81	68·29	63·59	59·8	54·93	56·03	56·73	59·03	60·93	. .	68·78
Paramatta . .	*N. Holl.*	33 49 S.	151 1 E.	. .	73·	68·25	60·0	59·	60·	53·3	51·5	56·5	62·	68·	72·	74·
Beirout . .	*Syria*	33 50 N.	35 26 E.	. .	53·97	58·20	61·26	63·34	71·30	75·41	81·95	82·07	79·63	79·82	65·70	56·69
Do.	Do.	,,	,,	. .	56·91	59·34	61·70	63·50	69·06	75·58	80·94	81·59	80·24	77·56	69·78	59·41
Stellenbosh .	*S. Africa*	33 50 S.	18 40 E.	293	77·01	77·64	73·17	65·92	60·19	57·82	56·83	59·22	60·78	64·56	69·83	74·21
Port Jackson .	*N. Holl.*	33 50 S.	151 10 E.	32	75·05	75·41	71·03	67·45	61·24	54·96	54·32	57·22	62·54	68·16	70·02	72·33
Fort Johnson .	*U. States*	33 51 N.	78 12 W.	. .	47·	55·	60·	67·	69·	75·	81·	83·	78·	67·	61·	57·
Cape Town .	*S. Africa*	33 56 S.	18 28 E.	. .	74·37	75·97	72·75	67·10	62·13	57·88	57·58	60·58	61·90	64·94	70·14	72·37
Fort Johnston .	*U. States*	34 0 N.	78 5 W.	. .	51·42	52·19	60·52	65·28	73·70	78·98	81·57	80·39	76·32	69·11	60·13	53·83
Columbia . .	*U. States*	34 0 N.	80 58 W.	. .	37·7	42·9	47·3	62·2	67·3	72·4	76·1	76·5	66·3	53·2	43·7	39·5
Swellendam .	*S. Africa*	34 0 S.	20 20 E.	506	77·59	72·84	70·59	65·95	60·72	58·89	59·82	59·35	61·6	61·79	66·75	70·21
Hotten.Holland	*S. Africa*	34 2 S.	14 8 E.	3730	59·90	61·93	60·91	63·91	53·88	47·82	46·80	49·83	52·89	56·95	55·98	57·10
Cape of Good Hope	—	34 11 S.	18 26 E.	. .	67·58	67·91	65·76	62·62	57·61	54·14	54·41	54·63	56·77	59·97	62·46	65·35
Camden . .	*U. States*	34 17 N.	80 33 W.	. .	44·85	37·19	49·39	60·20	65·33	77·43	83·06	80·31	72·12	58·32	47·89	40·97
Adelaide . .	*Australia*	34 35 S.	138 45 E.	. .	84·44	79·25	78·69	65·42	61·38	56·88	54·25	58·13	60·31	68·13	72·50	82·00
Little Rock .	*U. States*	34 40 N.	92 12 W.	. .	40·	50·	57·	64·	70·	78·	79·	79·	71·	65·	50·	45·
Albany . .	*Australia*	35 2 S.	117 55 E.	. .	65·84	65·66	64·76	62·78	62·06	57·56	54·32	54·86	56·48	58·10	57·38	60·80
Canea . . .	*Candia*	35 29 N.	24 0 E.	. .	53·42	53·78	57·56	59·72	55·81	66·11	62·89	60·76	60·80	50·92	43·36	27·72
Fort Gibson .	*U. States*	35 47 N.	95 10 W.	. .	45·47	41·25	53·51	61·28	72·69	78·65	81·49	83·28	74·61	65·95	54·12	46·20
Oran . . .	*Barbary*	35 50 N.	0 40 W.	. .	49·17	55·13	55·22	61·21	66·90	74·59	74·41	75·54	72·77	66·70	58·06	51·37
Chapel Hill .	*U. States*	35 54 N.	79 18 W.	. .	38·65	49·09	51·48	62·43	67·91	77·13	78·83	76·40	72·37	60·38	52·15	42·35

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Vicksburg .	*U. States*	52·01	71·61	81·08	65·53	67·56	31·57	29·07	2	Sunrise, 12, sunset.
Funchal . .	*Madeira*	63·50	64·46	71·60	70·88	67·61	10·80	8·10	1	Daily extremes.
Fort Moultrie .	*U. States*	49·93	66·46	80·27	67·02	65·92	35·75	30·34	2	7, 2, 9.
Milledgeville .	*U. States*	. .	. .	85·00	. .	. .	. .	. .	1	7, 2, 9.
Zwartland . .	*S. Africa*	74·72	68·39	57·60	64·70	66·35	20·01	—17·12	2	12, evening.
Bagdad . .	*Turkey*	49·62	75·04	93·13	77·16	73·74	49·50	43·51	1	. .
Augusta . .	*U. States*	45·59	61·79	77·71	62·51	61·90	36·02	32·12	4	Sunrise, 1, 9.
Uitenhague .	*S. Africa*	69·72	63·89	55·90	. .	. .	15·88	13·82	1¾	Morning, 12, evening.
Paramatta .	*N. Holl.*	71·75	59 67	53·77	67·33	63·13	22·50	—17·98	. .	. .
Beirout . .	*Syria*	56·29	65·97	79·81	75·05	69·28	28·10	23·52	2½	Sunrise, 2, 8, 9.
Do.	Do.	58·55	64·76	79·36	75·85	69·64	24·68	20·81	1	9, 9.
Stellenbosh .	*S. Africa*	76·29	66·43	57·96	65·06	66·43	20·81	—18·33	2	Morning, evening.
Port Jackson .	*N. Holl.*	74·26	66·57	55·50	66·91	65·81	21·09	—18·76	1⅙	9, 12, 6.
Fort Johnson .	*U. States*	53·	65·33	79·67	68·67	66·67	36·00	26·67	1	7, 2, 9.
Cape Town .	*S. Africa*	74·23	67·33	58·69	65·66	66·47	18·39	—15·54	6½	. .
Fort Johnston .	*U. States*	52·48	66·50	80·31	68·52	66·96	30·15	27·83	5	7, 2, 9.
Columbia . .	*U. States*	40·03	58·93	75·	54·40	57·09	38·80	34·97	1	Daily extremes.
Swellendam .	*S. Africa*	73·55	65·75	59·35	63·38	65·51	18·70	—14·20	2	Morning, evening.
Hotten.Holland	*S. Africa*	59·64	59·57	48·15	55·27	55·66	17 11	—11·49	1	. .
Cape of Good Hope	—	66·95	62·00	54·39	59·73	60·77	13·77	12·56	5	1 yr. 2 hourly; 4 yrs. hourly.
Camden . .	*U. States*	41·00	58·31	80·27	59·44	59·76	45·87	39·27	1	Sunrise, 1, 9.
Adelaide . .	*Australia*	81·90	68·50	56·42	66·98	68·45	30·19	—25·48	1	10, 12, 2, 4.
Little Rock .	*U. States*	45·	63·67	78·67	62·	62·33	39·	33·67	. .	. .
Albany . .	*Australia*	64·10	63·20	55·58	57·32	60·06	11·52	—8·52	1	8, sunset, reduced.
Canea . . .	*Candia*	30·87	49·80	63·25	51·69	48·90	38·39	32·38	1	7, 2, 9.
Fort Gibson .	*U. States*	44·31	62·49	81·14	64·89	63·21	42·03	36·83	3	7, 2, 9.
Oran . . .	*Barbary*	51·89	61·11	74·85	65·84	63·42	26·37	22·96	2	. .
Chapel Hill .	*U. States*	43·36	60·61	77·45	61·63	60·76	40·18	34·09	4	Sunrise, 9, 3, 9.

Mean Temperature of each Month.

Lat. 36° 7′ to 38° 56′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Gibraltar . .	—	36 7 N.	5 21 E.	. .	58·00	57·63	63·21	66 00	69·55	75·13	79·46	78·88	73·83	67·38	62·08	58·17
Nashville . .	*Tennessee*	36 10 N.	86 49 W.	. .	38·23	40·81	49·43	61·92	68·34	76·49	79·48	75·78	70·80	55·30	45·15	39·63
Mosul . . .	*Persia*	36 19 N.	43 10 E.	. .	43·67	50·00	57·00	56·33	74·00	87·10	94·10	90·64	80·98	72·89	59·44	46·27
Constantine .	*Algiers*	36 20 N.	6 34 E.	. .	51·26	49·46	45·14	51·26	65·84	76·46	83·30	79·70	76·28	65·84	60·44	50·36
Gallatin . .	*Tennessee*	36 23 N.	86 40 W.	. .	47·	48·	46·	60·	67·	75·	76·	75·	71·	. .	54·	. .
Cadiz . . .	*Spain*	36 32 N.	6 18 W.	. .	51·40	53·73	55·21	59·64	63·75	68·16	70·27	72·86	70·17	67·10	58·80	53·58
Bona . . .	*Algiers*	36 50 N.	7 46 E.	. .	52·16	60·44	62·06	65·30	75·20	83·12	86·18	86·18	79·88	79·34	63·32	60·80
Algiers . .	—	36 47 N.	3 3 E.	. .	52·97	54·82	55·99	59·05	66·34	71·51	75·25	76·48	73·18	68·50	61·93	55·15
Tunis . . .	*Barbary*	36 42 N.	10 0 E.	. .	53·06	55·94	59·00	64·58	71·24	77·36	85·10	86·54	80·24	71·06	62·78	58·28
Fort Monroe .	*Virginia*	36 50 N.	76 22 E.	. .	42·83	44·85	50·67	58·24	67·83	75·78	79·65	79·50	72·72	63·78	53·49	47·82
Auckland . .	*N. Zeal.*	36 51 S.	174 45 E.	. .	67·92	67·33	64·25	60·5	54·75	51·67	49·	51·59	54·00	56·42	60·08	65·5
Norfolk . .	*Virginia*	36 58 N.	76 16 W.	. .	43·73	48·44	55·72	62·01	71·00	76·73	80·11	78·05	76·05	66·22	57·79	48·67
Williamsburg .	*Virginia*	37 5 N.	81 40 W.	. .	32·9	43·25	46·4	61·25	66·65	77·9	82·18	78·12	70·93	57·2	44·83	38·3
Catania . .	*Sicily*	37 30 N.	15 0 E.	64	49·28	54·28	55·99	60·98	71·67	78·96	86·54	88·25	78·67	69·96	59·68	54·97
Urmia . . .	*Persia*	37 30 N.	45 10 E.	5000	15·67	31·00	31·00	. .	. .	. .	75·58	74·67	46·33	56·00	44·67	29·33
Nicolosi . .	*Italy*	37 35 N.	15 6 E.	2318	50·41	50·11	57·00	59·45	69·06	72·82	80·83	82·13	73·54	64·94	58·37	53·20
St. Michael .	*Azores*	37 45 N.	25 15 W.	. .	59·	59·	59·5	61·	63·	67·	68·	70·	68·	63·	56·	55·6
Ætna . . .	*Sicily*	37 46 N.	15 1 E.	9807	15·64	15·35	22·23	24·69	34·30	38·08	46·09	47·37	38·80	30·18	23·61	18·45
Charlottesville	*Virginia*	38 2 N.	78 40 W.	. .	43·1	30·8	46·5	52·4	59·5	72·2	76·3	74·3	65·2	60·2	48·3	39·2
Palermo . .	*Sicily*	38 7 N.	13 22 E.	. .	51·42	51·33	54·01	58·35	64·81	71·15	75·72	76·35	72·64	67·01	59·14	54·73
Messina . .	*Sicily*	38 11 N.	15 34 E.	. .	54·21	54·21	56·66	60·58	67·21	73·87	78·46	79·09	75·54	69·42	62·67	56·48
Melbourne .	*Australia*	37 48 S.	144 59 E.	. .	64·77	66·82	64·58	56·30	53·37	50·16	48·28	47·89	52·75	55·01	61·70	62·90
Smyrna . .	*Turkey*	38 26 N.	27 7 E.	50	43·55	52·30	53·02	52·95	65·57	73·46	. .	. .	68·27	62·73	54·64	43·78
Jefferson Bar .	*Illinois*	38 28 N.	90 8 W.	. .	34·59	36·36	47·76	59·69	68·90	76·58	79·04	79·74	68·57	56·84	47·37	42·07
Fort Ross .	*N. Califor.*	38 34 N.	123 59 W.	. .	47·86	47·66	48·79	50·92	53·69	56·26	57·92	58·21	57·00	54·64	51·85	49·39
St. Louis . .	*Illinois*	38 36 N.	89 36 W.	. .	29·5	34·5	42·7	58·6	65·2	73·1	78·1	74 6	66·9	55·8	49·2	33·7
Lisbon . .	*Portugal*	38 42 N.	9 9 W.	. .	52·52	53·60	56·30	59·00	63·68	69·44	72·14	71·24	69·44	62·60	55·40	51·44
Mafra . . .	*Portugal*	38 56 N.	9 21 W.	746	49·7	48·5	52·	57·2	58·	62·	65·	64·5	65·	60·	52·5	49·8

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Gibraltar . .	—	57·93	66·25	77·82	67·76	67·44	21·83	19·89	2	9, 12, 5.
Nashville . .	*Tennessee*	39·56	59·90	77·25	57·08	58·45	41·25	37·69	5	. .
Mosul . . .	*Persia*	46·65	62·44	90·61	71·10	67·70	50·43	43·96	$1\frac{1}{6}$	Sunrise, 2, sunset.
Constantine .	*Algiers*	50·36	54·08	79·82	67·52	62·95	38·16	29·46	1	12.
Gallatin . .	*Tennessee*	..	57·67	75·33	..	..	..	..	1	7, 2, 9.
Cadiz . . .	*Spain*	52·90	59·53	70·43	65·35	62·06	21·46	17·53	$2\frac{1}{3}$	12, 6, red.
Bona . . .	*Algiers*	57·80	67·52	85·16	74·18	71·17	34·02	27·36	1	12.
Algiers . .	—	54·32	60·46	74·41	67·87	64·27	23·51	20·09	$3\frac{1}{2}$	Daily extremes.
Tunis . . .	*Barbary*	55·76	64·94	83·00	71·36	68·77	33·48	27·24	$3\frac{1}{3}$	Sunrise maximum.
Fort Monroe .	*Virginia*	45·17	58·91	78·31	63·33	61·43	36·82	33·14	3	N. Y.
Auckland . .	*N. Zeal.*	66·92	59·83	50·75	56·83	58·58	18·92	16·17	4	8, 2, 8.
Norfolk . .	*Virginia*	46·95	62·91	78·30	66·69	63·71	36·38	31·35	$1\frac{1}{2}$	7, 2, 9.
Williamsburg	*Virginia*	38·15	58·1	79·4	57·65	58·33	49·28	41·25	13	8, 2.
Catania . .	*Sicily*	52·84	62·87	84·58	69·44	67·44	38·97	31·74	3	Red.
Urmia . . .	*Persia*	25·33	..	..	49·00	..	..	59·91	1	Sunrise, 2, 9.
Nicolosi . .	*Italy*	51·24	61·84	78·59	65·62	64·32	32·02	27·35	6	Red.
St. Michael .	*Azores*	57·87	61·17	68·33	62·33	62·43	14·40	10·46	1	Red.
Ætna . . .	*Sicily*	16·48	27·07	43·85	30·86	29·57	32·02	27·37	$\frac{1}{6}$	Red.
Charlottesville	*Virginia*	37·70	52·80	74·27	57·90	55·67	45·50	36·57	1	Sunrise, 2.
Palermo . .	*Sicily*	52·50	59·05	74·41	66·36	63·08	25·02	21·91	39	Red.
Messina . .	*Sicily*	54·97	61·48	77·14	69·21	65·70	24·88	22·17	5	12, red.
Melbourne .	*Australia*	64·83	58·08	48·78	56·49	57·04	18·93	16·05	2	$8\frac{1}{2}$, 9.
Smyrna . .	*Turkey*	46·54	57·78	..	61·88	..	..	..	1	Sunrise, 2, 9.
Jefferson Bar .	*Illinois*	37·67	58·78	78·45	57·59	58·14	45·15	40·78	4	7, 2, 9.
Fort Ross . .	*N. Califor.*	48·31	51·15	57·45	54·50	52·86	10·55	9·14	4	7, 2, 6, red.
St. Louis . .	*Illinois*	32·57	55·50	75·27	57·30	55·16	48·60	42·70	7	Sunrise, 2, 9.
Lisbon . . .	*Portugal*	52·52	59·66	70·94	62·48	61·40	20·70	18·42	5	. .
Mafra . . .	*Portugal*	49·33	55·73	63·83	59·17	57·02	16·50	14·50	4	. .

Mean Temperature of each Month.

Lat. 38° 57′ to 41° 0′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Washington	*U. States*	38 57 N.	76 55 W.	115	36·11	37·81	45·96	55·73	66·88	75·07	78·51	76·63	68·50	57·17	44·93	39·36
Fort Severn	*Maryland*	38 58 N.	76 27 W.	..	29·28	35·13	46·26	55·05	67·09	73·16	79·68	77·23	72·36	61·55	53·82	38·51
Cincinnati	*Ohio*	39 6 N.	84 27 W.	..	32·6	31·6	43·2	53·7	63·2	70·8	75·6	73·2	63·8	53·8	40·5	31·6
Bokhara	*Tartary*	39 48 N.	64 55 E.	..	25·02	31·10	..	..	..	..	..	..	..	61·48	43·93	35·83
Cagliari	*Sardinia*	39 13 N.	9 6 E.	330	48·47	51·62	50·61	58·24	65·75	70·72	76·26	77·63	71·06	66·49	58·64	53·04
Baltimore	*Maryland*	39 18 N.	76 35 W.	..	30·88	33·00	39·25	52·12	60·60	70·88	75·25	74·66	66·60	54·88	44·33	38·75
Marietta	*Ohio*	39 25 N.	81 30 W.	..	32·02	34·03	42·93	53·17	61·87	69·29	72·76	70·96	63·52	51·77	42·16	34·74
Fort Miflin	*Pennsylv.*	39 51 N.	75 12 W.	..	33·54	28·67	38·69	52·16	63·46	75·23	81·57	77·	73·35	57·20	44·40	37·16
Philadelphia	*Pennsylv.*	39 57 N.	75 1 W.	..	30·08	29·40	38·78	49·45	61·18	68·65	73·92	71·51	63·60	51·70	40·32	30·72
Erseroum	*Armenia*	39 57 N.	40 57 E.	5225	17·96	23 63	34·54	48·66	51·89	65·82	72·08	72·94	62·42	51·63	37·72	23·04
Frankfort	*Pennsylv.*	40 0 N.	75 8 W.	..	32·15	28·40	39·73	47·09	60·80	65·76	72·61	69·43	64·57	51·56	43·22	34·00
Minorca	*Mediter.*	40 0 N.	4 20 W.	..	53·29	54·32	55·74	61·52	68·81	74·62	79·23	78·13	72·23	64·72	58·06	55·36
Augusta	*Illinois*	40 11 N.	90 52 W.	..	20·88	44·48	45·30	57·90	61·95	71·10	77·59	77·40	64·03	56·25	48·90	36·76
Trenton	*N. Jersey*	40 14 N.	74 50 W.	..	30·91	32·56	38·82	50·88	58·48	67·70	72·86	71·63	63·44	51·53	41·33	32·88
Newtown	*N. Jersey*	40 15 N.	74 49 W.	..	31·50	31·48	38·39	49·38	58·68	68·25	71·98	69·82	61·33	49·64	39·71	31·45
Lambertville	*N. Jersey*	40 23 N.	74 56 W.	..	27·37	29·	40·05	50·42	60·10	68·85	72·26	71·56	64·65	48·99	38·42	30·90
Steubenville	*Ohio*	40 25 N.	80 41 W.	..	29·72	30·03	38·75	52·11	61·11	68·78	73·89	70·53	62·97	59·89	38·81	30·81
Madrid	*Spain*	40 25 N.	3 42 W.	2066	42·44	44·42	48·20	55·58	63·14	71·96	78·26	78·98	68·00	56·48	47·84	42·62
Middletown	*N. Jersey*	40 26 N.	73 59 W.	..	34·80	38·17	42·43	53·10	61·47	66·83	71·93	72·23	66·40	57·37	45·73	34·80
Erasmus Hall	*N. York*	40 37 N.	73 58 W.	40	31·61	31·32	38·96	48·35	58·63	67·23	72·56	71·16	63·94	52·93	43·58	34·42
Union Hall	*N. York*	40 41 N.	73 56 W.	..	29·67	29·33	37·34	46·95	56·82	65·46	70·97	69·65	61·86	51·65	41·24	32·14
Fort Columbus	*N. York*	40 42 N.	74 2 W.	..	30·08	31·22	39·61	49·89	61·27	70·52	76·0	74·58	66·72	55·82	44·05	35·86
Woolnorth	*V. Diem. L.*	40 42 S.	144 43 E.	..	..	..	..	..	..	47·38	49·68	48·79	52·82	55·37	58·04	60·00
New York	*U. States*	40 43 N.	74 1 W.	..	45·45	31·64	40·83	52·99	62·36	67·72	73·14	71·92	64·44	52·94	42·21	34·27
Oyster Bay	*N. York*	40 50 N.	73 49 W.	..	28·56	31·79	34·86	49·31	57·59	66·81	72·68	70·18	63·15	53·19	43·83	33·96
Altamura	*Italy*	40 50 N.	16 30 E.	746	40·73	42·85	46·04	53·71	63·39	70·21	75·43	74·53	66·16	59·99	49·15	41·68
Naples	—	40 52 N.	14 15 E.	..	46·24	47·59	51·15	56·68	64·85	70·77	76·10	76·26	69·35	61·93	53·11	49·12
Clinton	*N. York*	41 0 N.	70 19 W.	16	30·42	30·51	35·92	44·21	53·19	63·67	69·52	68·58	62·55	52·04	42·52	33·23

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Washington .	*U. States*	37·76	56·19	76·74	56·87	56·89	42·40	38·98	8	7, 2, 9.
Fort Severn .	*Maryland*	34·31	56·13	76·69	62·58	57·43	50·40	42·38	1	7, 2, 9.
Cincinnati .	*Ohio*	31·93	53·37	73·20	52·70	52·80	44·	41·27	6	5, 2, 9.
Bokhara . .	*Tartary*	30·65	. .	. .	. .	. .	. .	. .	. .	. .
Cagliari . .	*Sardinia*	51·04	58·20	74·87	65·40	62·38	29·16	23·83	3	. .
Baltimore . .	*Maryland*	34·21	50·66	73·60	55·27	53·43	44·37	39·39	6	. .
Marietta . .	*Ohio*	33·60	52·66	71·00	52·48	52·44	40·74	37·40	18	Sunrise, 2, 9.
Fort Mifflin .	*Pennsylv.*	33·11	51·44	77·93	58·32	55·20	52·90	44·82	2	7, 2, 9.
Philadelphia .	*Pennsylv.*	30·07	49·80	71·36	51·87	50·78	44·52	41·29	8½	Sunrise, 2.
Erseroum . .	*Armenia*	21·54	45·03	70·28	50·59	46·86	54·98	48·74	2¼	9, 4.
Frankfort . .	*Pennsylv.*	31·52	49·21	69·27	53·12	50·78	44·2	37·75	2	Hourly.
Minorca . .	*Mediter.*	54·32	62·02	77·33	65·00	64·67	25 94	23·01	5	Daily extremes.
Augusta . .	*Illinois*	34·04	55·05	75·36	56·39	55·21	56·71	41·32	1	Sunrise, 2—3.
Trenton . .	*N. Jersey*	32·12	49·39	70·73	52·10	51·09	41·95	38·61	5	Sunrise, 2, 10.
Newtown . .	*N. Jersey*	31·48	48·82	70·02	50·23	50·13	40·53	38·54	3	7, 2, 9.
Lambertville .	*N. Jersey*	29·09	50·19	70·89	50·69	50·21	44·89	41·80	2	7, 2, 9.
Steubenville .	*Ohio*	30·19	50·66	71·07	53·89	51·45	44·17	40·88	12	6, 12, 6.
Madrid . .	*Spain*	43·16	55·64	76·40	57·44	58·16	36·54	33·24	2	Daily extremes.
Middletown .	*N. Jersey*	35·92	52·33	70·33	56·50	53·77	37·43	34·41	3	7, 2, 9.
Erasmus Hall .	*N. York*	32·45	48·65	70·32	53·48	51·22	41·24	37·87	17	N. Y.
Union Hall .	*N. York*	30·38	47·04	68·69	51·58	49·42	41·64	38·31	17	N. Y.
Fort Columbus	*N. York*	32·39	50·26	73·70	55·53	52·97	45·92	41·31	9	7, 2, 9.
Woolnorth	*V. Diem. L.*	. .	. .	48·62	55·41	. .	. .	. .	½	8, 2, 8.
New York .	*U. States*	30·12	52·06	70·93	53·20	51·58	48·69	40·81	1	N. Y.
Oyster Bay .	*N. York*	31·44	47·25	69·89	53·39	50·49	44·12	38·45	3	N. Y.
Altamura . .	*Italy*	41·74	54·39	73 38	58·44	57·	34·70	31·64	5	Sunrise, 1, 11½, red.
Naples . .	—	47·65	57·56	74·38	61·46	60·26	30·02	26·73	13	Sunrise, 2.
Clinton . .	*N. York*	31·39	44·44	67·26	52·37	48·86	39·10	35·87	16	N. Y.

Mean Temperature of each Month.

Lat. 41° 0′ to 42° 12′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Constantinople	*Turkey*	41 0 N.	29 0 E.	. .	41·18	39·20	45·86	51·80	61·34	67·64	74·12	72·32	65·48	65·48	50·72	42·44
Pera . . .	*Turkey*	41 0 N.	29 0 E.	. .	41·77	39·24	40·33	48·99	60·89	68·22	67·12	72·91	68·53	60·27	54·65	41·55
Trebisond .	*Turkey*	41 1 N.	39 45 E.	100	46·18	51·04	51·21	47·04	59·17	67·38	74·68	75·24	69·26	65·08	58·72	46·54
Bebek . . .	*Turkey*	41 7 N.	28 59 E.	150	41·71	45·21	49·99	52·64	61·68	70·14	76·37	76·28	69·93	63·03	57·63	41·36
Mount Pleasant	*N. York*	41 9 N.	73 47 W.	. .	28·55	29·52	38·11	47·89	57·47	67·75	71·57	71·06	62·54	59·76	40·37	30·16
Hudson . .	*Ohio*	41 15 N.	81 27 W.	. .	28·1	29·3	37·8	51·5	58·1	67·8	72·9	69·8	61·5	48·0	35·6	29·0
Newhaven.	*Connecticut*	41 18 N.	72 51 W.	. .	28·28	35·27	38·74	47·40	56·48	68·08	71·08	70·18	63·98	53·17	40·38	36·78
Farmer's Hall	*N. York*	41 20 N.	74 11 W.	425	25·90	28·29	36·96	47·06	55·84	64·53	70·08	67·29	59·24	48·47	36·08	26·94
North Salem .	*N. York*	41 20 N.	74 37 W.	170	26·17	25·35	35·98	46·70	56·85	66·	71·5	69·59	60·25	49·42	38·19	26·28
Ft. Trumbull	*Connecticut*	41 22 N.	72 5 W.	50	34·50	39·53	42·77	51·00	59·22	68·67	73·87	73·12	68·02	58·10	46·70	43·95
West Point .	*N. York*	41 22 N.	73 57 W.	160	27·97	30·27	39·30	51·57	61·91	70·48	74·14	73·96	62·87	53·11	43·64	38·10
Council Bluffs.	*Missouri*	41 25 N.	95 43 W.	800	22·61	26·59	37·43	51·82	66·56	73·98	77·38	76·11	65·24	53·65	38·50	24·21
Bloomington .	*Illinois*	41 26 N.	91 2 W.	. .	23·50	26·93	34·20	53·20	57·48	67·55	70·88	68·18	62·20	49·30	34·60	26·88
Fort Armstrong	*Illinois*	41 28 N.	90 33 W.	. .	23·78	26·28	37·47	51·26	63·83	73·59	77·92	76·21	63·67	54·58	39·82	30·53
Newburgh .	*N. York*	41 30 N.	74 5 W.	150	28·08	26·65	35·45	47·54	58·20	66·85	71·52	69·77	62·05	51·59	40·00	29·61
Fort Wolcott	*Massachus.*	41 30 N.	71 18 W.	. .	29·93	31·06	37·94	46·41	57·32	65·54	71·45	70·18	63·68	54·45	43·39	36·53
Montgomery .	*N. York*	41 32 N.	74 0 W.	. .	25·21	27·05	36·54	47·71	58·37	65·86	72·42	69·95	62·39	50·16	38·82	29·13
Dutchess . .	*N. York*	41 41 N.	73 55 W.	. .	26·40	27·71	36·85	50·14	59·92	68·64	70·27	71·89	63·42	51·95	40·53	31·17
Teflis . . .	*Georgia*	41 41 N.	45 17 E.	. .	31·89	33·89	42·40	52·50	64·54	72·41	78·28	76·98	66·04	56·84	44·42	36·75
Brown Univ.	*Massachus.*	41 49 N.	71 26 W.	. .	24·61	28·26	33·47	44·58	53·63	64·25	72·14	69·13	60·05	51·33	37·69	24·82
New Bedford	*Massachus.*	41 50 N.	70 50 W.	. .	28·58	30·35	37·67	45·14	59·82	64·98	69·81	69·64	62·16	53·38	42·72	32·49
Rome . . .	*Italy*	41 54 N.	12 25 E.	170	45·03	47·35	51·67	57·81	65·26	71·11	75·97	75·65	70·07	64·81	53·38	47·80
Kingstown .	*N. York*	41 55 N.	74 2 W.	188	27·04	27·12	37·26	49·53	59·07	66·85	73·22	70·55	62·31	50·01	40·04	29·98
Rhodez . .	*France*	42 0 N.	2 39 E.	. .	32·33	36·72	45·21	48·20	59·78	62·14	64·96	70·36	63·04	50·00	40·32	38·07
Red Hook . .	*N. York*	42 2 N.	73 56 W.	. .	24·67	26·06	35·83	49·14	57·99	67·02	71·86	68·64	61·60	50·43	39·58	27·58
Mendon .	*Massachus.*	42 5 N.	71 30 W.	. .	25·6	24·9	34·1	46·0	55·7	65·6	72·5	68·6	61·3	49·3	38·0	27·5
Westfield .	*Massachus.*	42 6 N.	72 43 W.	. .	26·65	29·40	37·55	47·90	61·20	68·05	74·40	69·35	60·40	51·25	38·95	32·05
MacquarieHar.	*V.Diem.L.*	42 12 S.	145 28 E.	. .	64·23	64·23	56·	57·56	48·88	43·05	45·46	48·40	58·79	56·51	57·90	64·23

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Constantinople	*Turkey*	40·94	53·00	71·36	60·56	56·47	34·92	30·42	$2\frac{1}{2}$	Reduced.
Pera . . .	*Turkey*	40·32	50·07	69·42	61·15	55·19	33·67	28·93	$1\frac{1}{2}$	8, 2, 10.
Trebisond . .	*Turkey*	47·92	52·47	72·43	64·35	59·30	33·08	24·51	$1\frac{1}{3}$	Sunrise, 2, 9.
Bebek . . .	*Turkey*	42·76	54·74	74·26	63·53	58·83	35·01	31·50	$1\frac{1}{2}$	Sunrise, 2, 9.
Mount Pleasant	*N. York*	29·41	47·82	70·13	54·22	50·40	43·02	40·72	11	N. Y.
Hudson . .	*Ohio*	28·80	49·13	70·17	48·37	49·12	44·80	41·37	7	9, ?.
Newhaven .	*Connecticut*	33·44	47·54	69·78	52·51	50·82	42·80	36·34	2	Sunrise, 2, 3.
Farmer's Hall	*N. York*	27·04	46·62	67·30	47·93	47·22	44·18	40·26	7	N. Y.
North Salem .	*N. York*	25·93	46·51	69·03	49·29	47·69	46·15	43·10	12	N. Y.
Ft. Trumbull	*Connecticut*	39·33	51·	71·89	57·61	54·95	39·37	32·56	2	7, 2, 9.
West Point .	*N. York*	32·11	50·93	72·86	53·21	52·28	46·17	40·75	4	7, 2, 9.
Council Bluffs.	*Missouri*	24·47	51·94	75·82	52·46	51·17	54·77	51·35	5	7, 2, 9.
Bloomington .	*Illinois*	25·77	48·29	68·87	48·70	47·91	47·38	43·10	4	. .
Fort Armstrong	*Illinois*	26·86	50·85	75·91	52·69	51·58	54·14	49·05	4	7, 2, 9.
Newburgh .	*N. York*	28·11	47·06	69·38	51·21	48·94	44·87	41·27	14	N. Y.
Fort Wolcott	*Massachus.*	32·51	47·22	69·06	53·84	50·66	41·52	36·55	9	7, 2, 9.
Montgomery .	*N. York*	27·13	47·54	69·41	50·46	48·63	47·21	42·28	14	N. Y.
Dutchess . .	*N. York*	28·43	48·97	70·27	51·97	49·91	45·49	41·84	13	N. Y.
Teflis . . .	*Georgia*	34·18	53·15	75·89	55·77	54·75	46·39	41·71	1	$\frac{1}{4}$ (2, 8, 12, 8).
Brown Univ.	*Massachus.*	25·90	43·89	68·51	49·69	47·00	47·53	42·60	2	. .
New Bedford	*Massachus.*	30·47	45·88	68·14	52·75	49·31	41·23	37·61	5	Sunrise, 2, sunset.
Rome . . .	*Italy*	46·73	58·25	74·24	62·75	60·49	30·94	27·51	20	7, $2\frac{1}{2}$, 9.
Kingstown .	*N. York*	28·05	48·62	70·21	50·79	49·42	46·18	42·16	14	N. Y.
Rhodez . .	*France*	35·71	51·06	65·82	51·12	50·93	38·03	30·11	4	. .
Red Hook . .	*N. York*	26·10	47·65	69·17	50·54	48·37	47·19	43·07	12	N. Y.
Mendon .	*Massachus.*	26·	45·27	68·90	49·53	47·43	47·60	42·90	9	Sunrise, 11, 2, sunset.
Westfield .	*Massachus.*	29·37	48·88	70·60	50·20	49·76	47·75	41·23	2	. .
MacquarieHar.	*V. Diem. L.*	64·23	54·15	45·64	57·73	55·44	21·18	18·59	$\frac{3}{4}$	9, 9.

Mean Temperature of each Month.

Lat. 42° 15′ to 42° 48′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Hudson .	. *N. York*	42 15 N.	73 45 W.	150	25·84	25·50	34·72	47·04	58·40	67·21	70·49	69·67	60·94	48·72	37·67	27·67
Medfield .	*Massachus.*	42 15 N.	71 20 W.	. .	23·81	26·09	34·53	43·69	54·48	64·69	68·92	68·09	59·21	49·17	38·56	29·68
Delaware .	. *N. York*	42 16 N.	74 58 W.	1384	22·78	27·61	34·44	41·91	54·10	66·18	70·21	65·75	57 05	46·88	40·16	29·53
Worcester .	*Massachus.*	42 16 N.	71 49 W.	. .	28·59	28·68	34·87	46·42	55·09	63·84	70·08	67·55	62·21	50·40	37·78	29·14
Lenox .	. *N. York*	42 18 N.	73 20 W.	. .	22·77	16·77	29·92	37·24	51·51	63·27	64·92	64·36	54·62	42·86	32·79	21·39
Detroit .	. *Michigan*	42 19 N.	82 58 W.	. .	20·89	31·66	41·68	51·86	60·31	71·26	74·32	72·09	65·24	56·96	39·56	29·91
Williams'Coll.	*Massachus.*	42 38 N	73 10 W.	1000	22·01	23·61	31·06	43·53	56·20	66·33	70·23	67·25	60·03	47·07	36·61	26·93
Kinderhook	. *N. York*	42 22 N.	73 43 W.	125	23·14	23·25	33·20	45·68	56·49	65·05	70·06	67·91	59·75	47·22	37·22	25·23
Cambridge	*Massachus.*	42 25 N.	71 23 W.	. .	24·97	27·01	35·46	46·76	56·66	67·36	72·44	70·66	62·43	50·71	38·75	30·05
Greenville	. *N. York*	42 25 N.	74 21 W.	. .	30·33	31·24	35·82	42·53	61·06	69·21	69·88	72·28	61·73	49·64	39·13	31·11
Fredonia .	. *N. York*	42 26 N.	79 24 W.	. .	27·86	26·26	35·18	45·35	55·54	65·32	71·16	68·32	60·87	50·32	39·32	29·48
Ithaca . .	. *N. York*	42 27 N.	76 30 W.	417	27·94	26·64	34·02	45·39	55·99	64·55	70·22	67·03	59·17	48·23	38·08	29·96
Oxford .	. *N. York*	42 28 N.	75 32 W.	961	22·51	22·08	31·56	44·16	55·32	63·63	67·90	65·93	57·99	45·96	34·98	25·46
Salem . .	*Massachus*	42 31 N.	70 54 W.	. .	25·59	27·75	35·38	46·02	56·84	67·19	72·49	70·53	62·96	51·34	39·96	30·29
Prattsburg	. *N. York*	42 34 N.	77 20 W.	. .	23·10	23·12	30·28	44·71	53·84	62·40	66·92	65·83	56·85	46·39	34·41	26·71
Deerfield .	*Massachus.*	42 35 N.	72 39 W.	. .	20·6	13·6	31·15	41·65	53·6	64·	69·65	65·	57·65	42·95	39·1	27·6
Andover .	*N. Hamps.*	42 38 N.	71 0 W.	. .	24·5	26·	33·4	45·3	56·1	66·6	70·4	70·	61·3	49·2	37·4	29·9
Cortland .	. *N. York*	42 38 N.	76 11 W.	1096	24·03	21·67	30·59	42·65	54·29	62·23	66·06	64·29	57·43	45·70	34·35	26·15
Hartwick .	. *N. York*	42 38 N.	75 1 W.	1100	22·44	24·00	32·81	43·36	56·78	64 27	67·27	65·10	58·30	47·30	37·02	27·10
Albany .	. *N. York*	42 39 N.	73 44 W.	130	23·94	25·07	34 89	47·83	59·75	68·05	72·04	69·93	61·38	49·20	38·07	28·28
Ipswich .	*Massachus.*	42 39 N.	70 52 W.	. .	30·	30·	38·	48·	56·5	68·	70·5	70·	63·5	51·6	39·	37·
Cuba . .	. *N. York*	42 40 N.	78 0 W.	. .	18·10	22·48	28·03	40·42	51·22	62·60	63·53	63·22	55·80	43·84	31·61	23·81
Perpignan	. *France*	42 42 N.	2 54 E.	170	41·90	42·58	52·25	56·08	65·30	70·70	77·90	76·55	65·53	65·30	52·70	50·00
Cayuga .	. *N. York*	42 43 N.	76 37 W.	447	28·92	28·08	37·33	46·38	56·59	66·08	71·75	70·29	62·83	50·83	40·20	30·71
Pen Yan .	. *N. York*	42 43 N.	77 10 W.	. .	25·95	25·36	34·16	39·46	56·09	65·65	69·86	67·01	59·04	47·59	37·60	28·54
Williamstown	*Massachus.*	42 43 N.	73 13 W.	930	22·56	20·62	28·72	41·93	54·00	64·03	68·40	64·57	58 33	46·98	39·13	25·46
Lansinburgh .	*N. York*	42 47 N.	73 40 W.	30	23·63	24·92	33 75	46·94	59·23	68·07	71·75	69·95	61·37	49·66	38·45	27·59
Cherry Valley	*N. York*	42 48 N.	74 47 W.	1335	22·66	21·14	29·72	43·11	53·58	63·53	67·51	65·24	57·90	45·35	33·96	25·69

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Hudson .	. *N. York*	26·34	46·72	69·12	49·11	47·82	44·99	42·78	10	N. Y.
Medfield .	*Massachus.*	26·53	44·23	67·23	48·98	46·74	45·11	40·70	12	Sunrise, 2, 9.
Delaware .	. *N. York*	26·64	43·48	67·38	48·03	46·38	47·43	40·74	3	N. Y.
Worcester .	*Massachus.*	28·80	45·46	67·16	50·13	47·89	41·49	38·36	5	Sunrise, 2, sunset.
Lenox .	. *N. York*	20·31	39·56	64·18	43·42	41·87	48·15	43·87	2	. .
Detroit .	. *Michigan*	27·49	51·28	72·56	53·92	51·31	53·43	45·07	3½	8, 2.
Williams Coll.	*Massachus.*	42·18	43·6	67·94	47·90	45·91	48·22	43·76	11	. .
Kinderhook	. *N. York*	23·87	45·12	67·67	48·06	46·18	46·92	43·80	14	N. Y.
Cambridge	*Massachus.*	27·34	46·29	70·15	50·63	48·61	47·47	42·81	24	7, 2, 9.
Greenville	. *N. York*	30·89	46·47	70·46	50 17	49·50	41·95	39·57	8⅔	N. Y.
Fredonia .	. *N. York*	27·87	45·36	68·27	50·17	47·92	44·90	40·40	13	N. Y.
Ithaca .	. *N. York*	28·18	45·13	67·27	48·49	47·27	43·58	39·09	12	N. Y.
Oxford .	. *N. York*	23·35	43·68	65·82	46·31	44·79	45·82	42·47	15	N. Y.
Salem . .	*Massachus.*	27·88	46·08	70·07	51·42	48·86	33·62	28·48	42	8, 12, 10, sunset.
Prattsburg	. *N. York*	24·31	42·94	65·05	45·88	44·55	43·82	40·74	8	N. Y.
Deerfield .	*Massachus.*	20·60	42·13	66·21	46·57	43·88	56·05	45·61	2	7, 1½, 10, sum.; 6, 2, 10, win.
Andover .	*N. Hamps.*	26·80	44·93	69·00	49·30	47·51	45·90	42·20	11	Sunrise, maximum.
Cortland .	. *N. York*	23·95	42·51	64·19	45·83	44·12	44·39	40·24	11	N. Y.
Hartwick .	. *N. York*	24·51	44·32	65·55	47·75	45·48	44·83	41·04	10	N. Y.
Albany .	. *N. York*	25·67	47·49	70·01	49·55	48·20	48·10	44·25	19	N. Y.
Ipswich .	*Massachus.*	32·33	47·50	69·50	51·37	50·18	40·50	37·17	3	. .
Cuba . .	. *N. York*	21·46	39·89	63·12	43·75	42·06	45·43	41·66	2⅓	10, 10.
Perpignan	. *France*	44·83	57·88	75·04	61·18	59·74	36·00	30·21	6	. .
Cayuga .	. *N. York*	29·24	46·77	69·37	51·29	49·17	43·67	40·13	8	N. Y.
Pen Yan .	. *N. York*	26·62	43·24	67·51	48·08	46·36	44 50	40·89	16	. .
Williamstown	*Massachus.*	22·88	41·55	65·67	48·15	44·56	47·78	42·79	4	7, 2, 9.
Lansinburgh .	*N. York*	25·38	46·64	69·92	49·83	47·94	48·12	44·54	16	N. Y.
Cherry Valley	*N. York*	23·16	42·14	65·43	45·74	44·12	46·37	42·27	13	N. Y.

Mean Temperature of each Month.

Lat. 42° 49′ to 43° 10′.

		Lat.	Long	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Hamilton . .	*N. York*	42 49 N.	75 34 W.	1127	23·43	22·52	29·11	44·87	54·34	61·94	66·47	64·86	57·18	45·88	34·75	25·66
Middlebury .	*N. York*	42 49 N.	78 10 W.	800	25·86	26·05	34·29	45·69	55·85	63·92	68·85	66·83	59·26	49·16	31·37	29 33
Canandaigua .	*N. York*	42 50 N.	77 15 W.	. .	23·62	21·88	32·37	46·28	56·03	65·66	70·29	66·70	57·34	48·25	35·78	26·68
Mont Louis .	*France*	42 50 N.	2 5 E.	5222	30·42	29·75	39·43	38·75	48·20	54·05	58·10	59·00	53·15	44·60	34·25	34·25
Canajoharie .	*N. York*	42 53 N.	74 35 W.	284	20·18	22·85	31·44	47·29	58·33	63·79	71·05	68·64	59·52	48·02	37·29	24·72
Hobart Town	*V. Diem. L.*	42 53 S.	147 28 E.	. .	63·06	63·07	55·46	53·47	45·72	40·68	40·18	45·56	47·13	54·06	57·06	63·04
Auburn . .	*N. York*	42 55 N.	76 28 W.	650	24·96	25·56	33·87	45·86	54·54	64·01	71·00	67·33	58·17	47·85	37·57	23·26
Bridgewater .	*N. York*	42 55 N.	75 17 W.	1286	20·64	21·79	29·88	42·29	52·76	59·58	66·64	62·90	55·44	44·66	31·42	23·86
Buffalo . .	*N. York*	42 55 N.	78 55 W.	. .	23·41	21·14	35·49	40·70	55·29	67·45	71·55	69·99	59·89	48·75	37·22	27·80
Oneida Conferenz	*N. York*	42 55 N.	75 46 W.	1260	21·84	21·63	30·49	43·82	53·12	68·71	66·66	64·76	57·27	46·35	34·76	24·32
Pompey . .	*N. York*	42 56 N.	76 5 W.	1300	21·19	21·21	29·80	41·03	52·58	61·49	65·83	64·39	53·39	44·37	32·70	23·71
Fayetteville .	*Vermont*	42 58 N.	72 35 W.	. .	18·88	19·28	30·67	43·28	54·45	64·48	67·27	66·53	56·90	46·90	35·57	24·47
Onondaga . .	*N. York*	42 59 N.	76 6 W.	. .	26·71	25·44	33·69	45·12	57·94	65·36	68·63	68·17	59·91	48·64	36·94	28·98
Johnstown .	*N. York*	43 0 N.	74 23 W.	. .	23·28	22·01	31·19	42·39	55·85	65·26	69·11	67·66	58·30	46·68	34·[illegible]3	22·98
Syracuse . .	*N. York*	43 1 N.	76 15 W.	. .	30·90	20·56	26·64	45·51	58·30	66·66	71·24	71·48	64·28	47·72	32·80	32·12
Ft. Constitution	*N. Hamps.*	43 4 N.	70 49 W.	. .	24 50	27·10	34·60	45·31	55·55	62·80	67·89	66·47	59·09	50·43	40·32	37·58
Fairfield . .	*N. York*	43 5 N.	74 55 W.	1185	20·69	20·54	29·97	44·93	53·72	62·97	66·01	65·60	58·76	46·43	33·64	22·46
Palmyra . .	*N. York*	43 5 N.	77 16 W.	450	25·21	28·29	32·35	46·25	57·65	64·08	70·67	66·44	57·69	51·78	39·82	26·37
Lucca . . .	*Italy*	43 5 N.	10 30 E.	. .	39·25	42·04	55·02	59·32	68·65	73·22	76·37	73·56	66·65	62·38	49·78	39·56
Monroe . .	*N. York*	43 6 N.	77 39 W.	600	26·85	22·72	36·98	48·85	57·17	64·72	68·12	63·87	58·24	49·58	36·40	26·89
Utica . . .	*N. York*	43 6 N.	75 13 W.	173	23·67	23·29	32·11	44·03	56·23	63·97	68·39	66·34	58·52	47·57	35·40	26·28
Toulon . .	*France*	43 7 N.	5 55 E.	81	46·40	47·75	52·48	61·03	69·13	72·05	77·	76·55	71·60	66·20	55·85	51·35
Milville . .	*N. York*	43 8 N.	78 20 W.	. .	26·44	26·47	30·52	43·39	52·47	62·88	66·12	66·86	58·65	45·35	35·58	30·16
Oneida Institute	*N. York*	43 8 N.	75 14 W.	824	19·68	20·85	29·08	43·74	56·48	64·53	71·41	65·99	58·50	47·09	34·57	23·97
Rochester . .	*N. York*	43 8 N.	77 51 W.	506	26·21	24·90	32·62	45·91	55·85	64·33	70·39	66·86	60·04	47·66	37·11	28·39
Lewiston . .	*N. York*	43 9 N.	79 10 W.	280	26·53	26·04	34·56	45·92	56·69	64·41	71·19	69·19	61·43	50·18	38·07	28·49
Ca. Washington	*N. York*	43 1 N.	73 23 W.	. .	23·06	21·20	32·76	43·88	55·99	64·84	68·83	66·09	58·47	46·91	36·85	25·94
Oleron, Bearn.	*France*	43 10 N.	0 37 W.	692	42·58	41·68	48·20	52·25	60·80	68·00	73·63	70·25	66·88	56·53	44·83	42·35

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Hamilton .	. *N. York*	23·87	42·77	64·42	45·94	44·25	43·95	40·55	11	N. Y.
Middlebury	. *N. York*	27·08	45·28	66·53	46·60	46·37	42·99	39·45	14	N. Y.
Canandaigua .	*N. York*	24·06	44·89	67·55	47·12	45·91	48·41	43·49	12	N. Y.
Mont Louis	. *France*	31·47	42·13	57·05	44·00	43·66	29·25	25·58	5	
Canajoharie	. *N. York*	22·58	45·69	67·83	48·28	46·09	50·87	45·25	4	N. Y.
Hobart Town	*V.Diem.L.*	63·06	51·55	42·14	52·75	52·37	22·89	20·92	1	9, 9.
Auburn .	. *N. York*	24·59	44·76	67·45	47·86	46·17	47·74	42·86	16	N. Y.
Bridgewater .	*N. York*	22·10	41·64	63·04	43·84	42·66	46·00	40·90	4	N. Y.
Buffalo .	. *N. York*	24·12	43·83	69·66	48·62	46·56	50·41	45·54	2	N. Y.
Oneida Conferenz	*N. York*	22·60	42·48	66·71	46·13	44·48	47·08	44·11	14	N. Y.
Pompey .	. *N. York*	22·04	41·14	63·90	43·49	42·64	44·64	41·86	17	N. Y.
Fayetteville	. *Vermont*	20·88	42·80	66·09	46·46	44·06	18·39	45·21	6	Sunrise, 2, 9.
Onondaga .	. *N. York*	27·04	45·58	67·39	48·50	47·13	43·19	40·35	14	N. Y.
Johnstown	. *N. York*	22·76	43·14	67·34	46·37	44·90	47·10	44·58	12	N. Y.
Syracuse .	. *N. York*	27·86	43·48	69·79	48·27	47·35	50·92	41·93	1	N. Y.
Ft.Constitution	*N.Hamps.*	28·39	45·15	65·72	49·95	47·30	43·39	37·33	4	7, 2, 9.
Fairfield .	. *N. York*	21·23	42·81	64·86	46·28	43·79	45·47	43·63	13	N. Y.
Palmyra .	. *N. York*	26·62	45·42	67·06	49·76	47·22	45·46	40·44	2	N. Y.
Lucca . .	. *Italy*	40·28	61·00	74·38	59·60	58·82	37·12	34·10	36	8, 2, red.
Monroe .	. *N. York*	25·49	47·67	65·57	48·07	46·70	45·40	40·08	5	7, 2, 9.
Utica . .	. *N. York*	24·41	44·12	66·23	47·16	45·48	45·10	41·82	17	N. Y.
Toulon .	. *France*	48·50	60·88	75·20	64·55	62·28	30·60	26·70	2	3 times.
Milville .	. *N. York*	27·69	42·13	65·29	46·53	45·41	40·42	37·60	4	N. Y.
Oneida Institute	*N. York*	21·50	43·10	67·31	46·72	44·66	51·73	45·81	7	N. Y.
Rochester .	. *N. York*	26·50	44·79	67·19	48·27	46·69	45·49	40·69	12	N. Y.
Lewiston .	. *N. York*	27·02	45·72	68·26	49·89	47·73	45·15	41·24	11	N. Y.
Ca.Washington	*N. York*	23·40	44·21	66·59	47·41	45·40	47·63	43·19	13	N. Y.
Oleron, Bearn.	*France*	42·20	53·75	70·63	56·08	55·67	31·95	28·43	4	

Mean Temperature of each Month.

Lat. 43° 12′ to 43° 47′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Concord .	*N. Hamps.*	43 12 N.	71 29 W.	. .	21·21	21·85	30·71	42·39	54·82	63·46	67·08	65·62	56·47	48·39	37·03	25·03
Dover . .	*N. Hamps.*	43 13 N.	70 54 W.	. .	24·04	23·56	31·80	42·74	53·75	63·86	70·44	66·74	58·75	46·42	35·51	25·15
Ancaster . .	*Canada*	43 15 N.	80 10 W.	. .	26·21	23·85	33·23	43·52	54·24	61·79	68·55	65·03	57·29	47·57	37·48	27·79
Fort Niagara .	*Canada*	43 15 N.	79 5 W.	250	26·86	25·20	34·39	47·52	59·77	68·90	74·60	73·06	63·85	58·94	48·12	39·32
Washington .	*N. York*	43 15 N.	73 30 W.	. .	23·23	22·91	32·39	45·01	55·47	66·04	68·68	69·20	59·50	45·51	36·97	29·96
Gaines . .	*N. York*	43 17 N.	78 15 W.	426	25·36	28·38	34·46	44·54	54·48	62·99	71·76	66·38	59·83	47·69	35·25	28·46
Marseilles . .	*France*	43 18 N.	5 22 E.	149	43·18	45·39	48·38	56·12	63·23	70·99	75·90	71·89	68·72	58·73	50·18	47·10
Pau . . .	*France*	43 18 N.	0 23 E.	. .	41·20	43·60	48·80	51·80	61·60	68·20	68·60	73·40	68·50	58·50	47·00	42·80
Siena . . .	*Italy*	43 19 N.	11 20 E.	1141	39·94	42·37	46·20	54·55	62·38	67·51	72·82	72·82	65·86	58·48	47·21	41·77
Granville . .	*N. York*	43 20 N.	73 17 W.	. .	21·98	20·78	31·42	43·35	55·32	66·86	71·11	67·68	59·26	47·97	34·21	23·35
Renselaer . .	*N. York*	43 27 N.	76 14 W.	334	24·98	23·31	30·46	41·43	51·36	63·55	66·75	67·52	59·50	45·02	32·49	25·91
Springville .	*N. York*	43 30 N.	78 50 W.	1060	25·26	24·79	31·35	46·87	53·36	60·13	67·92	63·24	58·02	46·06	35·05	31·14
Saco . . .	*Maine*	43 31 N.	70 26 W.	. .	18·15	21·17	31·50	43·38	55·13	65·80	67·77	68·52	62·46	48·08	33·18	25·05
Leghorn . .	*Italy*	43 33 N.	10 17 E.	. .	46·99	50·25	53·13	59·83	65·98	71·21	76·82	76·84	70·63	66·04	53·98	52·09
Montpellier .	*France*	43 36 N.	3 53 E.	106	42·13	44·83	48·88	57·43	64·40	72·50	78·35	77·00	70·25	61·93	50·68	45·73
Toulouse . .	*France*	43 36 N.	1 26 E.	. .	39·79	41·83	46·78	53·53	61·03	66·04	70·12	71·13	65·17	56·37	48·00	41·99
Portland . .	*Maine*	43 38 N.	70 18 W.	. .	17·63	24·02	35·53	42·18	57·40	64·88	69·95	68·15	64·16	48·78	39·25	25·70
Fort Preple .	*Maine*	43 38 N.	70 18 W.	20	21·82	24·94	33·41	45·44	54·49	64·29	69·71	67·19	59·00	49·28	38·45	31·32
Toronto . .	*Canada*	43 40 N.	79 22 W.	340	25·34	23·71	30·37	43·38	53·28	60·88	66·28	66·73	58·71	45·69	36·03	27·24
Cascina . .	*Italy*	43 40 N.	10 30 E.	. .	41·74	44·87	50·18	56·28	63·50	69·94	74·35	73·27	67·19	59·77	50·56	46·42
Arles . . .	*France*	43 41 N.	4 37 E.	. .	41·45	41·90	50·	55·63	66·20	70·70	78·80	75·43	71·38	59·23	49·10	41·68
Nice . . .	*Italy*	43 41 N.	7 6 E.	64	44·47	47·55	50·65	54·84	62·29	68·56	73·00	73·92	69·19	61·59	53·78	46·96
Dax . . .	*France*	43 42 N.	1 4 W.	138	43·70	43·93	52·25	54·50	62 60	66·88	68·00	70·93	60·88	56·08	47·98	44·60
Pisa . . .	*Italy*	43 43 N.	10 24 E.	181	42·33	46·38	50·88	57·00	65·55	69·98	74·89	76·39	71·11	61·34	51·91	45·77
DartmouthColl.	*N.Hamps.*	43 45 N.	72 22 W.	. .	15·80	15·17	25·57	37·63	51·17	61·57	64·40	62·33	55·03	43·07	31·97	17·20
Union . . .	*N. York*	43 45 N.	76 10 W.	250	23·73	23·17	32·97	48·53	57·27	64·68	69·96	66·85	60·46	41·30	37·74	26·52
Lowville . .	*N. York*	43 47 N.	75 33 W.	800	20·35	21·09	30·23	44·82	54·69	63·15	67·98	65·68	57·32	46·94	34·14	23·09
Florence . .	*Italy*	43 47 N.	11 15 E.	234	41·20	44·58	50·56	59·65	65·41	71 17	76·93	75·92	69·15	60·40	50·34	45·52

Mean Temperature of each Season, and the whole Year.

	Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
	°	°	°	°	°	°	°		
Concord . *N. Hamps.*	22·70	42·64	65·39	47·30	44·51	45·87	42·69	10	Sunrise, 12, 2, 9.
Dover . . *N. Hamps.*	24·25	42·76	67·01	46·89	45·23	46·88	42·76	10½	Sunrise, 1, 10.
Ancaster . . *Canada*	25·95	43·66	65·12	47·45	45·55	44·70	39·17	7	9, 9.
Fort Niagara . *Canada*	30·46	47·23	72·19	56·98	51·71	49·40	41·73	2	7, 2, 9.
Washington . *N. York*	25·37	44·29	67·97	47·33	46·24	46·29	42·60	6	N. Y.
Gaines . . *N. York*	27·40	44·49	67·04	47·59	46·63	46·40	39·64	4	N. Y.
Marseilles . . *France*	45·22	55·91	72·93	59·21	58·32	32·72	27·71	5	7, 2, 9.
Pau . . . *France*	42·53	54·06	70·06	58·00	56·17	32·20	27·53	5	. .
Siena . . . *Italy*	41·36	54·38	71·05	57·18	55·99	32·88	29·69	5½	Daily extremes.
Granville . . *N. York*	22·04	43·36	68·55	47·18	45·27	50·33	46·51	9	N. Y.
Renselaer . . *N. York*	24·73	41·08	65·94	45·67	44·36	44·21	41·21	6	N. Y.
Springville . *N. York*	27·06	43·86	63·76	46·38	45·27	43·13	36·70	5	N. Y.
Saco . . . *Maine*	21·46	43·34	67·36	47·91	45·02	50·37	45·90	2	7, 2, 7.
Leghorn . . *Italy*	49·78	59·65	74·96	63·55	61·98	29·85	25·18	25	9, 12, 8, 2.
Montpellier . *France*	44·23	56·90	75·95	60·95	59·51	36·22	31·72	11	. .
Toulouse . . *France*	41·20	53·78	69·10	56·51	55·15	31·34	27·90	11	9 times.
Portland . . *Maine*	22·45	45·04	67·66	50·73	46·47	52·32	45·21	1	7, 2, 9.
Fort Preple . *Maine*	26·03	44·45	67·06	48·91	46·61	47·89	41·03	5	7, 2, 9.
Toronto . . *Canada*	25·43	42·34	64·63	46·81	44·81	45·81	39·20	5	Hourly.
Cascina . . *Italy*	44·35	56·66	72·52	59·18	58·17	32·61	28·17	8	Sunrise, 1½, red.
Arles . . . *France*	41·68	57·27	74·98	59·90	58·46	37·25	33·30	2	. .
Nice . . . *Italy*	46·33	55·92	71·83	61·52	58·90	29·45	25·50	18	8, 8.
Dax . . . *France*	44·08	56·45	68·60	56·98	56·53	27·23	24·52	5	. .
Pisa . . . *Italy*	44·83	57·81	73·76	61·45	59·45	34·06	28·93	3	Reduced.
DartmouthColl. *N. Hamps.*	16·06	38·12	62·77	43·36	40·08	49·23	46·71	3	Sunrise, 1½, 9½.
Union . . . *N. York*	24·47	46·26	67·16	49·23	46·78	46·79	42·69	9	N. Y.
Lowville . . *N. York*	21·51	43·25	65·60	46·13	44·12	47·63	44·09	14	N. Y.
Florence . . *Italy*	43·77	58·54	74·67	59·96	59·24	35·73	30·90	12	7, 12, 11.

Mean Temperature of each Month.

Lat. 43° 48′ to 44° 50′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Tarascon	*France*	43 48 N.	4 21 E.	. .	40·10	44·83	53·15	59·23	65·30	72·05	78·13	75·88	71·15	62·60	52·03	44·38
Manosque	*France*	43 50 N.	5 48 E.	. .	37·40	36·95	39·43	46·85	70·25	78·58	84·20	84·20	75·20	62·38	41·90	39·20
Corsena	*Italy*	43 50 N.	10 30 E.	575	35·92	38·75	45·55	51·04	55·90	62·02	70·18	71·08	65·91	56·66	46·24	35·29
Bath	*Maine*	43 54 N.	69 48 W.	. .	23·2	23·3	31·6	41·9	52·4	61·5	68·7	66·1	59·2	47·7	35·9	25·1
Sacket's Harb.	*N. York*	43 55 N.	75 57 W.	. .	23·	32·	33·	48·	52·	65·	73·	71·	66·	52·	41·	26·
Camajore	*Italy*	43 55 N.	10 20 E.	. .	42·87	44·47	50·18	55·90	63·32	68·27	73·63	72·55	66·61	58·62	50·92	44·78
Avignon	*France*	43 57 N.	4 48 E.	90	40·64	44·06	48·92	56·12	64·58	65·30	74·12	74·84	66·56	59·18	49·10	43·16
Williamstown	*Vermont*	44 7 N.	72 32 E.	1590	15·49	15·72	25·45	38·23	50·28	59·45	64·04	61·36	52·98	41·78	30·08	18·06
Alais	*France*	44 7 N.	4 4 E.	437	41·	44·60	50·09	57·20	64·49	71·71	77·05	77·09	69·80	59·09	50·	42·85
Orange	*France*	44 7 N.	4 50 E.	153	42·26	48·20	57·02	62·60	70·70	80·42	88·34	82·40	73·76	67·10	57·02	49·82
Kingston	*Canada*	44 8 N.	76 39 W.	. .	19·	11·	27·	40·	58·	66·	70·	67·	60·	49·	37·	26·
Genoa	*Italy*	44 24 N.	8 54 E.	. .	46·74	48·58	51·96	57·20	67·26	71·87	77·45	75·92	72·95	62·26	53·71	46·67
Governeur	*N. York*	44 25 N.	75 35 W.	400	21·23	18·53	30·63	44·09	55·00	63·23	68·33	66·19	58·11	46·84	33·56	20·26
Bucharest	*Turkey*	44 27 N.	26 8 E.	. .	23·99	20·30	31·73	44·33	56·32	62·56	68·16	65·17	58·30	49·35	42·85	33·08
Burlington	*Vermont*	44 28 N.	73 13 W.	. .	21·39	21·46	31·04	41·84	54·57	64·59	69·80	68·66	59·71	47·13	35·03	24·34
Viviers	*France*	44 29 N.	4 41 E.	. .	33·58	38·08	48·20	54·95	63·95	68·45	73·85	74·98	65·98	57·20	45·50	38·30
Bologna	*Italy*	44 30 N.	11 21 E.	289	35·76	40·03	48·36	57·29	66·38	73·29	78·69	76·96	69·31	59·50	47·80	39·22
Sebastopol	*Crimea*	44 36 N.	33 32 E.	. .	34·27	36·52	42·37	50·92	61·54	70·09	71·15	70·48	63·41	53·76	44·08	37·04
Halifax	*N. Scotia*	44 39 N.	63 38 W.	. .	20·	18·	25·	30·	40·	50·	63·	70·	51·	51·	38·	25·
Fort Howard	*N. W. Ter.*	44 40 N.	87 0 W.	. .	18·44	20·16	31·19	43·28	57·13	68·38	72·25	68·83	57·61	47·51	34·29	21·00
St. Lawrence	*N. York*	44 40 N.	75 1 W.	394	18·41	18·60	29·59	42·82	54·10	63·70	68·08	66·20	57·12	44·79	33·15	21·78
Hampden	*Maine*	44 42 N.	68 56 W.	. .	8·88	21·	29·64	43·78	51·88	62·29	63·21	67·67	56·75	44·12	30·30	21·64
Plattsburg	*N. York*	44 42 N.	73 26 W.	. .	21·30	26·32	36·40	44·63	52·18	58·85	65·92	67·58	55·40	45·77	33·71	22·12
Fort Sullivan	*Maine*	44 47 N.	67 4 W.	. .	20·83	20·68	30·98	39·69	49·65	57·92	64·55	63·82	57·28	47·22	35·83	27·35
Penetanguishene	*Canada*	44 48 N.	80 40 W.	600	21·38	19·66	29·42	36·08	51·98	65·23	70·38	68·54	53·18	45·85	36·66	23·97
Alba	*Italy*	44 48 N.	8 2 E.	. .	33·89	36·77	43·23	55·74	66·02	74·08	73·85	73·85	71·87	51·17	44·92	37·94
FranklinMalone	*N. York*	44 50 N.	74 23 W.	645	28·24	26·15	31·42	45·08	52·67	60·22	66·90	65·45	55·17	46·92	32·85	21·22
Bordeaux	*France*	44 50 N.	0 35 W.	. .	41·	45·05	51·35	56·08	50·80	66·88	73·18	73·18	67·10	58·10	48·43	43·25

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
Tarascon .	. *France*	43·10	59·23	75·35	61·93	59·90	38·03	32·25	5	2 times.
Manosque .	. *France*	37·85	52·18	82·33	59·83	58·05	47·25	44·48	4	. .
Corsena .	. *Italy*	36·65	50·83	67·76	56·27	52·88	35·79	31·11	1	12, red.
Bath . .	. *Maine*	23·87	41·97	65·43	47·60	44·72	45·50	41·56	10½	Sunrise, 2, sunset.
Sacket's Harb.	*N. York*	27·	44·33	69·67	53·	48·50	50·	42·67	1	7, 2, 9.
Camajore .	. *Italy*	44·04	56·46	71·49	58·71	57·67	30·76	27·45	40	Sunrise, 2, red.
Avignon .	. *France*	42·62	56·55	71·42	58·28	57·22	34·20	28·80	25	Sunrise, 2.
Williamstown.	*Vermont*	16·42	37·99	61·62	41·61	39·41	48·55	45·20	13	8, 1, 9.
Alais . . .	. *France*	42·82	57·27	75·29	59·63	58·75	36·09	32·47	36	. .
Orange .	. *France*	46·76	63·44	83·72	65·96	64·97	46·08	36·96	. .	. .
Kingston .	. *Canada*	18·67	41·67	67·67	48·67	44·17	59·00	49·00	1	. .
Genoa . .	. *Italy*	47·33	58·81	75·08	62·97	61·05	30·78	27·75	4	. .
Governeur	. *N. York*	20·01	43·24	65·92	46·17	43·83	49·80	45·91	10	N. Y.
Bucharest .	. *Turkey*	25·79	44·13	65·30	50·16	46·36	47·86	39·51	2	7–8.
Burlington	. *Vermont*	22·40	42·48	67·68	47·29	44·96	48·41	45·28	7	Sunrise, 1, 9.
Viviers .	. *France*	36·65	55·70	72·43	56·23	55·25	41·40	35·78	4	. .
Bologna .	. *Italy*	38·35	57·43	76·30	58·87	57·74	42·93	37·95	22	12, red.
Sebastopol	. *Crimea*	35·94	51·62	70·57	53·76	52·97	36·88	34·63	10	Daily extremes.
Halifax .	. *N. Scotia*	21·	31·67	61·	46·67	40·08	52·	40·	2	N. Y.
Fort Howard	*N. W. Ter.*	19·77	43·87	69·82	46·47	44·98	54·11	50·05	9	7, 2, 9.
St. Lawrence .	*N. York*	19·60	42·17	65·99	45·02	43·20	49·67	46·39	16	N. Y.
Hampden .	. *Maine*	17·17	41·77	64·39	43·72	41·76	58·59	47·22	1	Sunrise, 9, 3, 9.
Plattsburg	. *N. York*	23·25	44·40	64·12	44·96	44·18	46·28	40·87	1	N. Y.
Fort Sullivan .	*Maine*	22·95	40·11	62·10	46·78	42·98	43·87	39·15	5	7, 2, 9.
Penetanguishene	*Canada*	21·67	39·16	68·05	45·23	43·53	50·72	46·38	1	8, 8.
Alba . . .	. *Italy*	36·21	55·00	73·92	55·67	55·20	40·19	37·71	2	Reduced.
FranklinMalone	*N. York*	21·87	43·06	64·19	44·98	43·52	48·66	42·32	3	N. Y.
Bordeaux .	. *France*	43·10	56·08	71·08	57·88	57·03	32·18	27·98	10	. .

Mean Temperature of each Month.

Lat. 44° 53′ to 45° 57′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Fort Snelling	*N. W. Ter.*	44 53 N.	93 8 W.	820	13·58	18·66	32·12	46·	62·11	70·83	75·47	71·98	59·41	49·27	33·36	15·60
St. Antony	*N. W. Ter.*	44 53 N.	93 8 W.	. .	11·68	19·92	37·39	43·75	61·28	70·19	75·47	72·77	60·58	42·56	30·58	3·26
East Port .	. *Maine*	44 54 N.	66 56 W.	. .	19·18	22·71	29·85	38·72	48·99	56·31	63·28	63·24	57·15	46·33	36·18	24·55
Sympheropol	. *Crimea*	44 57 N.	34 6 E.	831	32·25	32·97	36·68	48·27	57·36	65·23	68·54	66·67	58·80	53·62	43·41	32·25
Puy . .	. *France*	45 3 N.	3 53 E.	. .	38·75	41·63	51·33	55·27	64·72	71·49	71·20	74·71	66·27	56·35	51·24	39·67
Anguillaria	. *Italy*	45 6 N.	11 56 E.	. .	33·82	37·04	44·98	51·01	60·31	66·29	73·36	70·48	63·05	54·88	42·04	37·87
Clodia . .	. *Italy*	45 6 N.	12 20 E.	. .	38·32	40·17	44·83	54·32	63·01	70·16	74·57	73·85	69·06	58·60	49·39	41·34
Chioggia .	. *Italy*	45 10 N.	12 20 E.	. .	37·40	37·63	49·10	52·48	64·40	70·25	72·05	73·40	65·53	61·25	43·03	45·73
Pavia . .	. *Italy*	45 11 N.	6 56 E.	287	32·79	37·45	46·60	55·33	64·90	70·57	75·58	75·25	67·10	56·41	43·16	37·76
Turin . .	. *Italy*	45 11 N.	7 41 E.	911	30·90	36·30	44·56	52·63	64·	68·45	72·91	73·18	64·36	54·46	42·58	33·19
Mont Cenis	. *Italy*	45 14 N.	6 55 E.	6395	19·76	29·88	33·67	41·68	52·21	55·06	57·13	58·93	. .	. .	. .	. .
Padua . .	. *Italy*	45 24 N.	11 52 E.	. .	35·62	38·44	45·37	54·41	64·00	70·41	74·53	72·82	66·04	56·19	45·95	38·44
Venice .	. *Italy*	45 26 N.	12 21 E.	21	35·29	38·98	46·15	54·73	63·39	70·39	75·07	73·72	66·27	56·66	44·65	39·92
Verona .	. *Italy*	45 26 N.	11 0 E.	. .	37·11	41·72	50·27	59·14	68·88	74·26	79·18	78·78	70·07	60·87	47·95	39 31
Milan . .	. *Italy*	45 28 N.	9 11 E.	767	33·22	38·30	45·88	54·66	64·09	70·68	74·75	73·58	66·47	56·95	47·08	36·57
Brescia .	. *Italy*	45 30 N.	10 7 E.	500	36·43	41·36	49·03	56·89	64·15	69·85	75·02	73·76	67·10	59·79	47·39	40·06
Chambery	. *Italy*	45 30 N.	5 55 E.	876	30·94	36·79	44·24	51·39	59·70	63·86	68·72	66·72	61·61	52·05	42·78	38·01
Montreal .	. *Canada*	45 31 N.	73 35 W.	. .	15·01	19·22	30·98	45·82	60·49	69·25	73·57	71·37	61·15	48·66	34·43	19·13
Do.	Do.	,,	,,	. .	13·98	16·08	27·50	40·02	53·38	65·97	69·67	66·21	58·50	45·10	32·70	18·69
Vienne .	. *France*	45 32 N.	4 53 E.	. .	36·28	38·98	49·10	55·63	63·95	69·13	72·95	73·40	65·75	54·95	43·25	41·
Trieste .	. *Germany*	45 38 N.	13 46 E.	. .	38·26	39·45	44·87	52·93	63·28	69·04	72·61	72·52	65·23	57·22	47·62	40·60
Vicenza .	. *Italy*	45 43 N.	11 33 E.	. .	30·60	32·00	43·03	57·20	66·29	72·91	75·70	71·65	68·90	63·32	43·61	36·50
St. Bernard	*Switzerland*	45 50 N.	6 6 E.	8174	16·38	18·18	21·83	27·30	36·03	40·75	44·24	44·11	38·80	31·08	23·83	19·26
Mackinac .	. *Michigan*	45 51 N.	85 5 W.	728	10·53	15·31	28·56	34·03	48·67	58·35	67·34	66·64	56·82	43·47	34·78	16·97
Conegliano	. *Italy*	45 54 N.	12 20 E.	. .	37·18	38·75	45·05	52·70	65·30	71·83	74·30	74·75	69·80	70·25	50·00	39·65
Gorizia .	. *Italy*	45 54 N.	13 40 E.	. .	41·00	41·07	45·61	54·50	54·55	68·09	72·66	72·70	68·07	54·68	47·98	45·59
Sacile . .	. *Italy*	45 54 N.	12 30 E.	. .	35·69	36·37	44·96	53·31	59·09	67 28	70·72	71·62	65·50	53·04	43·75	40·60
St. Rambert	. *France*	45 57 N.	5 37 E.	. .	31·66	37·18	46·74	55·60	68·70	83·91	86·54	84·63	74·48	62·69	48·99	38·37

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Fort Snelling	*N. W. Ter.*	15·95	46·74	72·76	47·35	45·70	61·89	56·81	8	7, 2, 9.
St. Antony	*N. W. Ter.*	11·62	47·47	72·81	44·57	44·12	72·21	61·19	1	7, 2, 9.
East Port .	. *Maine*	22·15	39·19	60·94	46·55	42·41	44·10	38·79	3	. .
Sympheropol	. *Crimea*	32·49	48·10	66·81	51·94	49·84	36·29	34·32	14	9, 9, daily extremes.
Puy . .	. *France*	40·01	57·11	72·46	57·94	56·89	35·96	32·45	2	Noon.
Anguillaria	. *Italy*	36·25	52·09	70·05	53·33	52·93	39·54	38·80	6	. .
Clodia . .	. *Italy*	39·94	54·05	72·86	59·02	56·46	36·25	32·92	6	. .
Chioggia .	. *Italy*	40·26	55·33	71·89	56·59	56·03	35·32	29·47	2	. .
Pavia . .	. *Italy*	36·01	55·60	73·81	55·56	55·24	42·79	37·80	7	Sunrise, 2—3.
Turin . .	. *Italy*	33·46	53·73	71·51	53·80	53·13	42·28	38·05	30	Sunrise, 12, sunset, red.
Mont Cenis	. *Italy*	. .	42·51	57·04	. .	. .	. .	39·17	. .	M. 12, 4, red.
Padua . .	. *Italy*	37·49	54·59	72·59	56·05	55·18	38·91	35·10	34	Sunrise, maximum.
Venice .	. *Italy*	38·06	54·76	73·06	55·86	55·44	39·78	35·00	7	Sunrise, + 1½, 2, 9, red.
Verona .	. *Italy*	39·38	59·43	77·41	59·63	58·96	42·07	38·03	37	Sunrise, 1—2, 9, 2.
Milan . .	. *Italy*	36·03	54·88	73·00	56·83	55·19	41·53	36·97	59	Sunrise, 2—3.
Brescia .	. *Italy*	39·29	56·68	72·88	58·10	56·73	38·59	33·59	24	Sunrise, 12, sunset, 12.
Chambery	. *Italy*	35·24	52·12	66·43	52·14	51·49	37·78	31·19	9	Daily extremes.
Montreal .	. *Canada*	17·79	45·76	71·40	48·08	45·76	58·56	53·61	10	7, 3.
Do.	Do.	16·25	40·30	67·28	45·43	42·32	55·69	51·03	5	Daily extremes.
Vienne .	. *France*	38·75	56·23	71·83	54·65	55·36	37·12	33·08	6	. .
Trieste .	. *Germany*	39·44	53·69	71·39	56·69	55·30	34·35	31·95	15	7, 2, 9.
Vicenza .	. *Italy*	33·03	55·51	73·42	58·61	55·14	45·10	40·39	5	. .
St. Bernard	*Switzerland*	17·94	28·38	43·03	31·23	30·15	27·86	28·09	21	Sunrise, 2.
Mackinac .	. *Michigan*	14·27	37·09	64·11	45·02	40·12	56·81	49·84	1	7, 2, 9.
Conegliano	. *Italy*	38·53	54·35	73·63	63·35	57·47	37·57	35·10	11	. .
Gorizia .	. *Italy*	42·55	51·55	71·15	56·91	55·54	31·70	28·60	7	. .
Sacile . .	. *Italy*	37·56	52·45	69·87	54·10	53·49	35·93	32·31	3	. .
St. Rambert	. *France*	35·74	57·01	85·03	62·05	59·96	54·88	49·29	3	. .

(This Paper will be continued in the next Part.)

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Fort Snelling	*N. W. Ter.*	15·95	46·74	72·76	47·35	45·70	61·89	56·81	8	7, 2, 9.
St. Antony	*N. W. Ter.*	11·62	47·47	72·81	44·57	44·12	72·21	61·19	1	7, 2, 9.
East Port .	. *Maine*	22·15	39·19	60·94	46·55	42·41	44·10	38·79	3	. .
Sympheropol	. *Crimea*	32·49	48·10	66·81	51·94	49·84	36·29	34·32	14	9, 9, daily extremes.
Puy . .	. *France*	40·01	57·11	72·46	57·94	56·89	35·96	32·45	2	Noon.
Anguillaria	. *Italy*	36·25	52·09	70·05	53·33	52·93	39·54	33·80	6	. .
Clodia . .	. *Italy*	39·94	54·05	72·86	59·02	56·46	36·25	32·92	6	. .
Chioggia .	. *Italy*	40·26	55·33	71·89	56·59	56·03	35·32	29·47	2	. .
Pavia . .	. *Italy*	36·01	55·60	73·81	55·56	55·24	42·79	37·80	7	Sunrise, 2—3.
Turin . .	. *Italy*	33·46	53·73	71·51	53·80	53·13	42·28	38·05	30	Sunrise, 12, sunset, red.
Mont Cenis	. *Italy*	. .	42·51	57·04	. .	. .	. .	39·17	. .	M. 12, 4, red.
Padua . .	. *Italy*	37·49	54·59	72·59	56·05	55·18	38·91	35·10	34	Sunrise, maximum.
Venice .	. *Italy*	38·06	54·76	73·06	55·86	55·44	39·78	35·00	7	Sunrise, + 1½, 2, 9, red.
Verona .	. *Italy*	39·38	59·43	77·41	59·63	58·96	42·07	38·03	37	Sunrise, 1—2, 9, 2.
Milan . .	. *Italy*	36·03	54·88	73·00	56·83	55·19	41·53	36·97	59	Sunrise, 2—3.
Brescia .	. *Italy*	39·29	56·68	72·88	58·10	56·73	38·59	33·59	24	Sunrise, 12, sunset, 12.
Chambery	. *Italy*	35·24	52·12	66·43	52·14	51·49	37·78	31·19	9	Daily extremes.
Montreal .	. *Canada*	17·79	45·76	71·40	48·08	45·76	58·56	53·61	10	7, 3.
Do.	Do.	16·25	40·30	67·28	45·43	42·32	55·69	51·03	5	Daily extremes.
Vienne .	. *France*	38·75	56·23	71·83	54·65	55·36	37·12	33·08	6	. .
Trieste .	. *Germany*	39·44	53·69	71·39	56·69	55·30	34·35	31·95	15	7, 2, 9.
Vicenza .	. *Italy*	33·03	55·51	73·42	58·61	55·14	45·10	40·39	5	. .
St. Bernard	*Switzerland*	17·94	28·38	43·03	31·23	30·15	27·86	28·09	21	Sunrise, 2.
Mackinac .	. *Michigan*	14·27	37·09	64·11	45·02	40·12	56·81	49·84	1	7, 2, 9.
Conegliano	. *Italy*	38·53	54·35	73·63	63·35	57·47	37·57	35·10	11	. .
Gorizia .	. *Italy*	42·55	51·55	71·15	56·91	55·54	31·70	28·60	7	. .
Sacile . .	. *Italy*	37·56	52·45	69·87	54·10	53·49	35·93	32·31	3	. .
St. Rambert	. *France*	35·74	57·01	85·03	62·05	59·96	54·88	49·29	3	. .

Mean Temperature of each Month.

Lat. 46° 5′ to 47° 13′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Carlsburg	*Transylv.*	46 5 N.	23 33 E.	..	31·89	42·85	40·35	52·36	60·13	67·44	69·91	71·53	60 94	52·75	37·58	34·23
Trent	*Tyrol*	46 6 N.	11 6 E.	746	31·48	37·72	44·47	51·82	63.19	69·44	72·82	72·14	67·37	55·51	43·72	38·35
Rochelle	*France*	46 9 N.	1 10 W.	..	40·55	41·20	44·20	51·44	59·45	67·51	69·04	66·49	62·44	52·50	44·02	37·45
Hancock Barracks	*Maine*	46 10 N.	67 50 W.	..	9·40	14·35	26·39	43·85	53·45	61·25	64·10	63·43	51·58	45·84	32·80	26·48
Geneva	*Switzerl.*	46 12 N.	6 10 E.	1335	31·05	36·21	42·58	51·78	62·26	67·57	71·76	71·74	65·08	53·89	43·77	34·86
Astrachan	*Russia*	46 21 N.	48 5 E.	74	12·65	20·93	35·83	52·45	69·67	73·22	76·96	77·65	68·32	50·14	38·86	23·94
Luçon	*France*	46 27 N.	1 0 W.	..	36·95	41·68	50·	53·15	60·58	66·20	70·03	71·60	64·85	56·53	48·20	36·95
Vevay	*Switzerl.*	46 28 N.	6 50 E.	1332	33·24	36·16	43·03	50·23	58·24	64·40	68·45	64·40	59·56	53·38	40·10	38·30
Ouchy	*Switzerl.*	46 30 N.	6 38 E.	1300	26·24	39·22	42·67	41·29	55·47	64·00	68·36	70·21	62·02	52·66	39·94	36·57
Lausanne	*Switzerl.*	46 31 N.	6 38 E.	1634	30·24	36·32	40·37	48·20	56·93	64·65	63·73	65·84	59·37	49·57	40·12	31·91
Tolmezzo	*Lombardy*	46 31 N.	13 3 E.	..	28·76	32·77	39·25	48·49	59·36	66·74	69·22	68·77	63·55	51·46	41·25	33·60
St. Gothard	*Switzerl.*	46 32 N.	8 33 E.	7087	17·85	16·05	17·87	26·01	34·97	42·85	45·68	45·75	41·34	31·17	23·07	18·70
Poitiers	*France*	46 35 N.	0 21 E.	319	34·93	39·65	47·98	52·03	57·88	64·40	69·35	69·80	62·60	53·83	45·28	39·88
Cherson	*Russia*	46 38 N.	32 37 E.	..	25·23	30·96	38·21	50·70	62·06	69·89	71·40	68·70	60·33	50·36	36·50	25·47
Fort Brady	*Canada*	46 39 N.	84 43 W.	639	18·68	19·80	27·37	38·50	52·56	59·13	65·90	64·52	56·25	45·52	33·91	22·28
Trient	*Tyrol*	46 41 N.	11 4 E.	..	33·22	37·83	46·38	53·60	60·82	68·72	75·76	73·11	63·14	57·07	42·10	35·24
Cercivento	*Italy*	46 42 N.	12 56 E.	..	25·34	24·98	28·44	39·49	46·58	51·71	54·61	55·13	52·79	39·65	33·04	26·94
Clausenburg	*Transylv.*	46 44 N.	23 31 E.	1279	31·64	42·13	36·28	49·55	57·65	64·81	66·99	66·81	57·72	51·53	36·03	32·88
Quebec	*Canada*	46 48 N.	71 17 W.	..	15·91	12·65	22·66	39·65	54·84	63·95	73·40	66·88	62·38	42·80	33·13	13·89
Friburg	*Switzerl.*	46 48 N.	7 10 E.	2078	24·26	30·49	38·73	46·56	54·79	59·00	62·71	61·45	53·65	45·41	36·64	30·63
Chur	*Switzerl.*	46 50 N.	9 38 E.	1151	29·34	35·42	42·37	47·62	60·28	61·66	65·75	63·91	59·11	50·38	41·63	31·77
Marschlines	*Switzerl.*	46 55 N.	9 56 E.	2451	36·14	38·17	42·73	50·11	61·07	64·81	67·69	68·09	60·80	53·22	45·64	36·32
Berne	*Switzerl.*	46 57 N.	7 26 E.	1907	26·49	32·38	39·07	45·50	54·14	58·44	62·67	61·66	55·92	47·01	37·42	31·01
Nicolaief	*Russia*	46 58 N.	31 58 E.	..	24·51	28·49	37·65	50·83	62·06	70·09	72·64	70·	61·	49·26	36·57	26·98
Neufchâtel	*Switzerl.*	46 59 N.	6 55 E.	1438	33·80	37·20	43·25	49·10	57·88	64·18	67·10	68·23	61·14	52·48	42·58	36·05
Gratz	*Germany*	47 4 N.	15 27 E.	1285	25·54	30·78	37·06	46·94	57·97	65·91	68·36	65·93	60·15	48·40	41·63	28·02
Gries	*Tyrol*	47 12 N.	11 8 E.	3890	28·33	24·73	33·91	43·72	47·21	47·93	54·30	58·62	52·59	42·67	37·92	27·57
Nantes	*France*	47 13 N.	1 33 E.	..	39·20	41·23	50·00	53·83	60·13	65·75	69·58	70·70	64·18	54·95	47·75	41·45

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Carlsburg . .	*Transylv.*	38·32	50·95	69·63	50·42	51·82	39·64	33·31	2	8, 2, 10.
Trent . . .	*Tyrol*	35·85	53·16	71·47	55·53	54·00	41·34	35·62	3	. .
Rochelle . .	*France*	39·73	51·70	67·68	52·99	53·02	31·59	27·95	7	7, 2, 9.
Hancock Barracks	*Maine*	16·74	41·23	62·93	43·41	41·08	54·70	46·19	2	7, 2, 9.
Geneva. . .	*Switzerl.*	34·04	52·21	70·36	54·25	52·71	40·71	36·32	30	Sunrise, 2.
Astrachan . .	*Russia*	19·17	52·66	75·94	52·43	50·05	65·00	56·77	. .	Noon, 12.
Luçon . . .	*France*	38·53	54·58	69·28	56·53	54·73	34·65	30·75	4	. .
Vevay . . .	*Switzerl.*	35·90	50·49	65·75	51·01	50·79	35·21	29·85	2	. .
Ouchy . . .	*Switzerl.*	34·01	46·48	67·52	51·54	49·89	43·97	33·51	. .	. .
Lausanne . .	*Switzerl.*	32·82	48·50	64·74	49·69	48·94	35·60	31·92	10	4 times.
Tolmezzo . .	*Lombardy*	31·71	49·03	68·24	52·09	50·27	40·46	36·53	5	Red.
St. Gothard .	*Switzerl.*	17·53	26·28	44·76	31·86	30·11	29·70	27·23	7	7, 1, 9.
Poitiers . .	*France*	38·14	52·63	67·84	53·89	53·13	34·87	29·70	10	. .
Cherson . .	*Russia*	27·23	50·32	70·00	49·06	49·15	46·17	42·77	4⅔	Daily extremes.
Fort Brady .	*Canada*	20·25	39·48	63·18	45·23	42·04	47·22	42·93	6	7, 2, 9.
Trient . . .	*Tyrol*	35·43	53·60	72·53	54·10	53·92	42·54	37·10	2	7, 5.
Cercivento . .	*Italy*	25·74	38·17	53·83	41·83	39·90	30·15	28·09	3	. .
Clausenburg .	*Transylv.*	35·55	47·83	66·20	48·43	49·50	35·35	30·65	2	7, 2, 9.
Quebec. . .	*Canada*	14·15	39·05	68·08	46·10	41·85	60·75	52·93	. .	. .
Friburg . .	*Switzerl.*	28·46	46·69	61·05	45·23	45·36	38·45	32·59	4	Daily extremes.
Chur . . .	*Switzerl.*	32·18	50·09	63·77	50·38	49·10	36·41	31·59	5	Red.
Marschlines .	*Switzerl.*	36·88	51·31	66·86	53·22	52·07	31·95	29·98	8	Red.
Berne . . .	*Switzerl.*	29·95	46·24	60·91	46·78	45·97	36·18	30·96	21	Daily extremes.
Nicolaief . .	*Russia*	26·66	50·18	70·91	48·94	49·17	48·13	44·25	10	10, 10.
Neufchâtel. .	*Switzerl.*	35·68	50·08	66·50	52·07	51·08	34·43	30·82	10	. .
Gratz . . .	*Germany*	28·11	47·32	66·73	50·06	48·06	42·82	38·62	4	8, 9, 10½, 12, 3, 5, 9.
Gries . . .	*Tyrol*	26·88	41·61	53·62	44·39	41·63	33·89	26·74	2	7, 5.
Nantes . . .	*France*	40·63	54·65	68·68	55·63	54·90	31·50	28·05	6	. .

Mean Temperature of each Month.

Lat. 47° 14′ to 48° 13′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Besançon .	*France*	47 14 N.	6 2 E.	799	34·70	36·95	43·93	53·18	66·65	68·68	70·25	66·88	61·25	47·98	38·75	36·73
Innsprück .	*Tyrol*	47 16 N.	11 23 E.	1886	27·05	33·06	41·05	50·47	58·89	65·01	65·05	64·76	59·16	52·63	38·39	29·93
Dijon . .	*France*	47 19 N.	5 2 E.	805	36·37	35·20	41·20	49·15	58·11	65·22	68·86	66·21	60·00	51·56	43·53	35·20
Zürich . .	*Switzerl.*	47 23 N.	8 32 E.	1336	27·25	34·12	39·94	45·46	60·26	61·50	65·68	65·26	58·10	49·93	39·09	30·24
Kitzbühel .	*Tyrol*	47 27 N.	12 24 E.	2504	25·95	31·53	36·97	47·30	57·85	61·88	65·73	65·23	57·31	47·71	35·87	29·64
Ofen, or Buda .	*Hungary*	47 29 N.	19 3 E.	863	25·05	28·35	36·39	48·20	58·12	64·42	66·58	66·34	59·54	48·40	38·68	29·66
Tegernsee .	*Tyrol*	47 30 N.	11 32 E.	2399	28·38	30·24	32·72	43·43	52·70	58·60	62·92	60·80	56·57	44·29	36·07	28·44
Basle . .	*Switzerl.*	47 34 N.	7 32 E.	804	30·33	34·48	41·36	48·90	57·79	63·19	65·95	65·12	58·44	50·11	40·53	35·53
St. John's .	*Newfoundl.*	47 34 N.	52 28 W.	. .	23·34	20·88	24·18	33·40	39·30	48·02	56·16	57·86	53·04	44·50	33·98	25·32
Frederichshafen	*Germany*	47 39 N.	9 28 E.	1280	29·01	33·69	34·50	45·01	54·46	65·86	71·04	72·82	56·89	48·27	38·12	28·35
Issny . . .	*Germany*	47 42 N.	10 2 E.	2327	28·83	32·11	36·97	43·79	53·98	61·05	62·20	61·30	55·20	45·32	37·74	31·08
Wangen (Altgau)	*Germany*	47 42 N.	9 50 E.	1815	26·15	29·91	37·00	45·77	55·63	62·96	63·82	64·13	57·90	49·35	38·26	30·94
Ravensburg .	*Germany*	47 47 N.	9 37 E.	1458	33·13	29·97	30·65	49·10	51·58	59·	67·55	64·63	56·75	45·05	48·20	23·67
Peissenberg .	*Germany*	47 48 N.	11 1 E.	3213	28·24	30·78	33·85	43·21	52·30	55·92	60·51	60·26	53·56	44·51	35·89	31·12
Weingarten .	*Germany*	47 48 N.	9 39 E.	1548	34·36	33·46	36·73	44·26	58·78	63·50	68·79	65·08	58·66	45·84	30·54	27·27
St. Andex .	*Germany*	47 58 N.	11 12 E.	2302	29·37	31·32	38·03	48·04	58·96	65·08	67·71	66·	60·80	48·92	37·18	29·73
Tuttlingen. .	*Germany*	47 59 N.	8 50 E.	2110	27·25	30·63	36·73	43·05	54·46	61·54	63·46	61·43	55·99	46·49	40·28	30·15
Schussenried .	*Germany*	48 1 N.	9 40 E.	1850	26·94	30·38	37·02	44·11	55·81	60·13	65·41	62·04	57·45	46·22	37·51	29·03
Kremsmünster	*Bohemia*	48 3 N.	14 7 E.	. .	26·28	28·49	36·91	47·17	55·31	61·03	64·40	63·28	56·48	46·78	37·02	30·20
Landsberg. .	*Germany*	48 3 N.	10 53 E.	2018	27·03	33·55	38·80	47·53	52·68	58·66	61·68	61·05	55·78	47·50	36·07	32·92
Schwenningen.	*Germany*	48 4 N.	8 33 E.	2319	29·12	31·89	35·85	44·22	53·29	61·12	62·67	62·15	55·51	46·40	38·01	29·52
Sigmaringen .	*Germany*	48 5 N.	9 13 E.	1931	23·67	29·57	38·05	46·81	57·22	63·30	65·05	64·18	56·46	48·25	37·36	30·65
Biberach . .	*Germany*	48 6 N.	9 47 E.	1753	40·03	33·64	38·41	45·05	64·49	68·90	72·10	67·33	62·04	47·77	39·38	33·55
Bogenhausen .	*Germany*	48 9 N.	11 36 E.	1676	26·13	30·81	39·09	46·72	53·58	58·96	63·12	61·57	56·39	47·68	36·28	32·36
Munich. . .	*Germany*	48 9 N.	11 36 E.	1676	29·59	33·01	41·18	46·92	57·61	62·11	64·74	64·09	58·17	49·21	39·02	34·90
Riedlingen. .	*Germany*	48 10 N.	9 30 E.	1755	27·32	26·26	41·95	48·63	61·57	63·37	64·27	64·63	58·12	49·95	36·73	33·42
Denainvilliers.	*France*	48 12 N.	3 23 E.	543	34·93	39·65	41·90	50·90	59·23	66·88	69·35	67·55	61·48	51·80	42·13	37·40
Vienna. . .	*Austria*	48 13 N.	16 23 E.	479	29·28	33·53	40·80	51·85	62·15	67·48	70·75	69·96	61·90	51·22	40·35	33·04

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Besançon . .	*France*	36·12	54·57	68·61	49·33	52·16	35·55	32·49	5	3 times.
Innsprück . .	*Tyrol*	30·01	50·14	64·94	50·06	48·79	38·00	34·93	55	4, 2.
Dijon . . .	*France*	35·59	49·49	66·77	51·69	50·88	33·66	31·18	3	Daily extremes.
Zürich . . .	*Switzerl.*	30·54	48·56	64·15	49·03	48·69	38·43	33·61	6	Red.
Kitzbühel . .	*Tyrol*	29·04	47·37	64·28	46·96	46·91	39·78	35·24	3	7, 5.
Ofen, or Buda .	*Hungary*	27·69	47·57	65·78	48·87	47·48	41·53	38·09	9	9, 9.
Tegernsee . .	*Tyrol*	29·02	42·95	60·77	45·64	44·60	34·54	31·75	8	7, 2, 9.
Basle . . .	*Switzerl.*	33·44	49·35	64·76	49·69	49·30	35·62	31·32	17⅓	Daily extremes.
St. John's .	*Neufoundl.*	23·18	32·29	54·01	43·84	38·33	36·98	30·83	5	Daily extremes.
Frederichshafen	*Germany*	30·35	44·66	69·91	47·76	48·17	44·47	39·56	2	7, 2, 9.
Issny . . .	*Germany*	30·67	44·91	61·52	46·09	45·80	33·37	30·55	11	7, 2, 9.
Wangen(Altgau)	*Germany*	29·01	46·13	63·64	48·49	46·83	37·98	34·63	10	7, 2, 9.
Ravensburg .	*Germany*	28·92	43·78	63·73	50·00	46·61	43·88	34·81	1	7, 2, 9.
Peissenberg .	*Germany*	30·04	43·12	58·89	44·65	44·17	32·27	28·85	17	7, 2, 9.
Weingarten .	*Germany*	31·71	46·58	65·80	45·01	47·28	41·52	34·09	2	7, 2, 9.
St. Andex . .	*Germany*	30·13	41·34	66·27	48·97	48·43	38·34	36·14	8	7, 2, 9.
Tuttlingen. .	*Germany*	29·34	44·75	62·14	47·59	45·96	36·21	32·80	7½	7, 2, 9.
Schussenried .	*Germany*	28·78	45·64	62·53	47·05	46·00	38·47	33·75	5¼	7, 2, 9.
Kremsmünster	*Bohemia*	28·32	46·46	62·90	46·76	46·11	38·12	34·58	20	Red.
Landsberg .	*Germany*	31·17	46·34	60·46	46·45	46·10	34·65	29·29	1	Red.
Schwenningen.	*Germany*	30·18	44·44	61·97	46·65	45·82	33·55	31·79	9	7, 2, 9.
Sigmaringen .	*Germany*	27·96	47·36	64·18	47·36	46·71	41·38	36·22	13	7, 2, 9.
Biberach . .	*Germany*	35·74	49·33	69·44	49·73	51·06	38·55	33·70	1	7, 2, 9.
Bogenhausen .	*Germany*	29·77	46·47	61·21	46·78	46·06	36·99	31·44	12	Sunrise, 2½, sunset.
Münich . .	*Germany*	32·50	48·57	63·65	48·80	48·38	35·15	31·15	25	6, 1½, 9.
Riedlingen. .	*Germany*	29·00	50·72	64·09	46·93	47·69	38·37	35·09	2	7, 2, 9.
Denainvilliers .	*France*	37·33	50·68	67·93	51·80	51·93	34·42	30·60	30	8, 2, 11.
Vienna. . .	*Austria*	31·95	51·60	69·40	51·16	51·03	41·47	37·45	60	8, 3, 10.

Mean Temperature of each Month.

Lat. 48° 15′ to 49° 1′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Endingen .	*Germany*	48 15 N.	8 50 E.	906	33·73	33·06	39·74	42·53	56·82	64·96	69·58	66·81	59·88	49·44	36·57	30·69
Augsburg .	*Germany*	48 21 N.	10 53 E.	1566	25·95	30·76	38·14	48·02	56·62	61·21	64·63	63·43	57·22	47·12	37·40	31·57
Ulm . .	*Germany*	48 23 N.	10 0 E.	495	27·75	29·10	37·92	44·96	59·97	63·05	63·88	64·18	57·13	46·40	39·27	31·10
Genkingen.	*Germany*	48 25 N.	9 10 E.	2558	24·62	30·96	34·97	43·88	53·76	55·85	60·24	59·86	51·98	44·69	37·56	31·71
Phullingen	*Germany*	48 27 N.	9 13 E.	1396	28·26	31·53	36·48	45·43	56·17	62·51	62·56	59·92	57·99	47·39	40·51	31·91
Freudenstadt	*Germany*	48 28 N.	8 26 E.	2391	27·72	33·53	33·28	38·03	49·93	63·46	63·52	56·55	54·28	49·15	43·41	33·87
Scheuern .	*Germany*	48 30 N.	11 27 E.	. .	29·75	39·65	35·60	52·25	62·60	60·58	66·65	64·85	58·33	50·45	38·98	38·30
St. Brieux .	*France*	48 31 N.	2 46 W.	319	39·20	41·45	46·85	51·80	56·30	62·15	68·90	69·80	63·95	56·53	48·65	44·60
Tübingen .	*Germany*	48 31 N.	9 3 E.	1076	28·76	32·36	39·38	47·66	55·58	60·62	64·04	63·14	57·20	47·84	35·24	29·48
Passau . .	*Germany*	48 34 N.	13 27 E.	926	29·03	31·05	33·15	42·94	55·78	64·74	64·54	60·89	57·54	48·67	39·56	32·20
Strasburg .	*France*	48 35 N.	7 45 E.	477	31·01	35·94	41·92	49·73	58·26	62·65	65·82	65·12	58·75	50·07	41·14	35·78
Dillengen .	*Germany*	48 35 N.	10 30 E.	1431	26·98	29·39	39·49	47·82	56·44	60·76	65·21	63·37	57·76	48·79	36·46	32·63
Lugan . .	*Russia*	48 35 N.	39 21 E.	. .	15·98	15·37	25·02	44·94	46·83	68·41	75·83	72·95	62·40	47·80	35·85	18·63
Bissingen .	*Germany*	48 36 N.	9 30 E.	1361	30·58	33·49	38·64	48·13	57·00	61·99	62·80	63·14	58·30	47·93	41·79	33·35
Fort Vancouver	*N. Amer.*	48 37 N.	122 37 W.	. .	38·	43·	44·	46·	54·	63·	66·	66·	61·	54·	43·	43·
Giengen .	*Germany*	48 37 N.	10 15 E.	1538	25·09	29·14	36·16	44·83	55·42	61·75	66·58	62·53	56·35	46·04	37·96	29·23
Hohenfürth	*Hungary*	48 37 N.	17 40 E.	1873	22·95	25·90	34·61	43·30	53·60	59·86	63·21	61·14	52·21	44·56	33·78	27·57
Winnenden	*Germany*	48 42 N.	9 23 E.	957	28·89	32·56	40·62	47·10	57·56	63·32	64·99	64·27	59·56	48·94	41·45	32·88
Hohenheim	*Germany*	48 43 N.	9 17 E.	1276	27·77	32·70	39·85	47·73	57·94	62·89	63·91	64·47	59·07	48·43	40·91	33·40
Calw . .	*Germany*	48 43 N.	8 45 E.	1139	30·74	34·39	38·75	48·20	53·65	60·17	61·72	61·	57·07	48·74	41·43	30·60
Stutgard .	*Germany*	48 46 N.	9 17 E.	812	30·	35·35	40·96	49·28	58·71	62·87	66·20	65·66	59·36	49·80	40·96	34·52
Wangen .	*Germany*	48 46 N.	9 15 E.	886	31·03	33·78	40·01	46·72	56·98	63·37	65·12	64·94	58·21	48·09	40·21	32·00
Stettin . .	*Germany*	48 48 N.	9 19 E.	864	29·34	32·11	38·57	42·96	58·82	63·79	66·34	64·24	60·15	49·30	40·24	35·29
Paris . .	*France*	48 50 N.	2 20 E.	121	35·77	38·98	43·79	50·18	57·34	63·30	65·75	65·41	60·33	52·17	44·51	38·56
Lüdwigsburg	*Germany*	48 53 N.	9 11 E.	948	31·50	35·13	40·75	45·23	58·06	67·10	69·22	65·50	60·67	49·42	40·26	33·96
Budweis .	*Bohemia*	48 59 N.	14 28 E.	1262	28·24	26·17	36·86	49·71	54·55	60·24	66·76	61·43	58·87	46·81	35·44	28·08
Montmorency	*France*	49 0 N.	2 18 E.	458	34·25	38·98	44·60	49·33	57·88	63·50	66·88	68·00	61·70	52·93	43·48	40·10
Carlsruhe .	*Germany*	49 1 N.	8 25 E.	346	31·68	36·43	42·28	50·81	59·92	64·51	67·62	66·67	60·26	50·74	41·54	35·56

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Endingen . .	*Germany*	32·49	46·36	67·12	48·63	48·65	38·89	34·63	3	7, 2, 9.
Augsburg . .	*Germany*	29·43	47·59	63·10	47·26	46·85	38·68	43·67	22	7, 2, 9.
Ulm . . .	*Germany*	29·32	47·62	63·70	47·60	47·06	36·43	34·38	4	7, 2, 9.
Genkingen .	*Germany*	29·10	44·20	58·65	44·74	44·17	35·62	29·55	7	Red.
Phullingen .	*Germany*	30·56	46·02	61·66	48·63	46·72	34·30	31·10	8	7, 2, 9.
Freudenstadt .	*Germany*	31·71	40·41	61·18	48·95	45·56	35·80	29·47	1	7, 2, 9.
Scheuern . .	*Germany*	35·89	50·16	64·02	49·26	49·84	36·90	28·13	1	7, 2, 9.
St. Brieux . .	*France*	41·74	51·64	66·94	56·37	54·18	30·60	25·20	8	. .
Tübingen . .	*Germany*	30·20	47·54	62·60	46·76	46·78	35·28	32·40	10	7, 2, 9.
Passau . . .	*Germany*	30·76	43·95	63·39	48·58	46·67	35·71	32·63	2	8, 1, 10.
Strasburg . .	*France*	34·24	49·97	64·53	49·99	49·68	34·81	30·29	32	6½, 12, 6½.
Dillengen . .	*Germany*	29·67	47·92	63·11	47·67	47·09	38·23	33·44	1	Red.
Lugan . . .	*Russia*	16·66	38·93	72·40	48·69	44·17	60·46	55·79	7	8 times.
Bissingen . .	*Germany*	32·47	47·93	62·65	49·35	48·09	32·56	30·18	6	7, 2, 9.
Fort Vancouver	*N. Amer.*	41·33	48·	65·	52·67	51·75	28·	23·67	1	7, 2, 9.
Giengen . .	*Germany*	27·82	45·47	63·62	46·78	45·93	41·49	35·80	11	7, 2, 9.
Hohenfürth .	*Hungary*	25·47	43·84	61·40	43·52	43·56	40·26	35·93	15	Sunrise, 2—3.
Winnenden .	*Germany*	31·44	48·43	64·19	49·98	48·51	36·10	32·75	8	7, 2, 9.
Hohenheim .	*Germany*	31·29	48·51	63·76	49·47	48·26	36·70	32·47	7	7, 2, 9.
Calw . . .	*Germany*	31·91	46·87	60·96	49·08	47·21	31·12	29·05	2	7, 2, 9.
Stutgard . .	*Germany*	33·29	49·65	64·91	50·04	49·47	36·20	31·32	50	7, 2, 9, red.
Waugen . .	*Germany*	32·27	47·91	64·47	48·83	48·38	34·09	32·20	11	7, 2, 9.
Stettin . . .	*Germany*	32·25	46·78	64·79	49·90	48·43	37·	32·54	3	7, 2, 9.
Paris . . .	*France*	37·77	50·43	64·82	52·33	51·34	29·88	27·05	32	Daily extremes.
Lüdwigsburg .	*Germany*	33·53	48·01	67·27	50·12	49·73	37·72	33·74	6	7, 2, 9.
Budweis . .	*Bohemia*	27·50	47·03	62·80	47·03	46·09	40·59	35·30	2	Sunrise, 2—3.
Montmorency .	*France*	37·78	50·60	66·13	52·70	51·80	33·75	28·35	15	Sunrise, 2, 9.
Carlsruhe . .	*Germany*	34·51	51·01	66·27	50·86	50·68	35·94	31·70	52	7, 2, 9.

Mean Temperature of each Month.

Lat 49° 1′ to 49° 55′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Ratisbon	*Germany*	49 1 N.	11 56 E.	1148	26·87	31·66	38·12	49·55	59·11	62·67	65·95	64·36	58·01	47·91	37·06	29·66
Neu Bistritz	*Moravia*	49 2 N.	17 27 E.	2035	22·12	26·62	33·40	42·89	52·36	57·45	61·16	58·73	53·20	43·43	32·29	26·73
Rehberg	*Bohemia*	49 6 N.	13 27 E.	. .	21·94	26·80	33·69	41·02	50·34	56·98	59·41	57·81	52·16	43·52	34·68	26·55
Saint Lô	*France*	49 6 N.	1 5 W.	139	40·78	39·42	42·37	48·99	52·60	62·11	62·34	59·93	58·94	52·38	45·45	37·71
Metz	*France*	49 7 N.	6 10 E.	596	30·26	34·08	40·84	49·56	57·90	62·72	64·82	63·66	56·98	48·19	40·65	34·00
Westheim	*Germany*	49 7 N.	9 50 E.	1230	30·78	33·53	39·27	43·86	56·64	64·00	67·06	65·17	56·84	47·44	37·92	31·37
Rossfeld	*Germany*	49 8 N.	10 5 E.	1435	27·18	29·32	35·89	43·07	55·09	60·64	64·42	63·05	57·58	46·22	37·18	29·86
Weinsberg	*Germany*	49 9 N.	9 18 E.	717	32·05	34·43	40·93	51·32	62·04	64·72	65·75	67·73	60·40	49·84	42·82	33·33
Oehringen	*Germany*	49 13 N.	9 31 E.	769	27·66	31·26	38·53	47·21	57·43	61·07	66·27	60·28	58·91	47·80	42·06	33·71
Burglengenfeld	*Germany*	49 13 N.	11 52 E.	1211	26·15	28·85	37·45	48·22	53·96	60·37	64·31	62·31	57·07	47·17	35·38	33·10
Anspach	*Germany*	49 18 N.	10 34 E.	1272	27·32	29·46	38·35	47·23	54·32	59·70	63·05	62·47	56·10	47·62	37·40	34·16
Schönthal	*Germany*	49 21 N.	9 32 E.	684	30·29	32·25	39·85	48·18	58·37	64·00	67·12	65·68	59·45	49·06	40·35	33·51
Tabor	*Bohemia*	49 24 N.	14 40 E.	1385	23·07	28·06	35·85	46·18	55·99	63·12	66·63	64·27	56·86	47·75	36·75	31·46
Rouen	*France*	49 26 N.	1 6 E.	127	36·92	37·31	41·12	49·40	56·69	64·22	65·75	63·68	61·88	52·76	45·20	37·55
Heidelberg	*Germany*	49 28 N.	8 42 E.	333	31·62	36·43	43·77	53·04	61·03	65·53	68·70	66·88	60·67	51·42	41·68	36·70
Manheim	*Germany*	49 29 N.	8 27 E.	274	33·33	35·60	40·15	50·70	59·50	67·21	68·81	66·27	61·77	49·35	38·75	31·91
Mergentheim	*Germany*	49 30 N.	9 46 E.	682	29·95	32·16	39·58	48·47	58·26	66·02	66·88	64·29	59·83	49·30	41·41	33·55
Seelau	*Moravia*	49 32 N.	17 33 E.	1279	26·51	30·33	35·78	41·59	55·13	61·52	63·75	62·08	56·53	48·27	36·91	30·63
Brzeznitz	*Germany*	49 34 N.	9 17 E.	1515	24·30	28·38	36·84	47·35	55·09	60·31	64·15	61·97	55·38	46·92	36·86	33·13
Deutschbrod	*Bohemia*	49 36 N.	15 35 E.	1321	24·75	28·62	35·92	45·39	54·75	61·54	64·15	61·99	56·48	47·73	37·90	29·37
Herzogenaurach	*Germany*	49 36 N.	10 55 E.	. .	28·62	33·55	39·67	48·09	58·64	65·55	67·51	65·30	59·74	47·12	39·00	33·73
Pilsen	*Bohemia*	49 45 N.	13 23 E.	937	24·35	28·06	38·30	48·31	57·52	62·94	66·45	65·10	58·30	48·11	37·06	31·59
Treves	*Germany*	49 46 N.	6 38 E.	460	32·65	35·89	40·46	46·67	57·70	61·59	65·19	67·01	60·60	51·73	42·89	35·38
Würzburg	*Germany*	49 48 N.	9 56 E.	558	32·50	34·68	41·54	52·25	61·07	66·81	68·29	67·08	61·23	51·01	39·47	33·51
Brzezina	*Bohemia*	49 49 N.	15 58 E.	1663	24·55	28·47	36·73	44·74	53·62	60·33	63·46	59·52	54·82	45·68	36·19	30·
Zbirow	*Bohemia*	49 52 N.	13 46 E.	1620	23·88	26·46	36·28	45·75	53·92	58·98	63·23	62·56	56·80	46·47	34·34	34·39
Kuttenplan	*Bohemia*	49 54 N.	12 45 E.	1707	31·23	28·26	31·44	46·96	54·59	58·48	61·61	60·04	55·94	44·17	39·65	36·43
Landscron	*Galicia*	49 55 N.	18 57 E.	1121	23·13	27·70	35·94	45·07	56·05	62·69	65·73	63·25	56·01	47·23	36·91	29·23

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Ratisbon . .	*Germany*	29·40	48·93	64·33	47·66	47·58	39·08	34·93	62	True noon.
Neu Bistritz .	*Moravia*	25·16	42·89	59·11	42·98	42·53	39·04	33·95	8	Sunrise, 2—3.
Rehberg . .	*Bohemia*	25·10	41·68	58·07	43·45	42·08	37·47	32·97	10	Sunrise, 2—3.
Saint Lô . .	*France*	39·30	47·99	61·46	52·26	50·25	24·63	22·16	3	Daily extremes.
Metz . . .	*France*	32·78	49·43	63·73	48·61	48·64	34·56	30·95	22	9, 12, 3, red.
Westheim . .	*Germany*	31·89	46·58	65·41	47·39	47·82	36·28	33·52	5	7, 2, 9.
Rossfeld . .	*Germany*	28·79	44·68	62·70	46·99	45·79	37·24	33·91	9	7, 2, 9.
Weinsberg . .	*Germany*	33·26	51·44	66·07	51·01	50·45	35·68	32·81	4	7, 2, 9.
Oehringen . .	*Germany*	30·88	47·72	62·54	49·59	47·68	38·61	31·66	7	7, 2, 9.
Burglengenfeld	*Germany*	29·37	46·54	62·33	46·54	46·20	38·16	32·96	1	Red. 3 times.
Anspach . .	*Germany*	30·31	46·63	61·75	47·03	46·43	35·73	31·44	1	Red.
Schönthal . .	*Germany*	32·02	48·81	65·59	49·62	49·01	36·83	33·57	8	7, 2, 9.
Tabor . . .	*Bohemia*	27·53	46·01	64·67	47·12	46·33	43·56	37·14	16	Sunrise, 2—3.
Rouen . . .	*France*	37·26	49·07	64·55	53·28	51·04	28·83	27·29	3	Daily extremes.
Heidelberg. .	*Germany*	34·92	52·61	67·04	51·26	51·46	37·08	32·12	14	9, 2½, 9.
Manheim . .	*Germany*	33·61	50·12	67·43	49·96	50·28	36·90	33·82	8	7, 2, 9.
Mergentheim .	*Germany*	31·89	48·77	65·73	50·18	49·14	36·93	33·84	4½	7, 2, 9.
Seelau . . .	*Moravia*	29·16	44·17	62·45	47·24	45·75	37·24	43·29	10	Sunrise, 2—3.
Brzeznitz . .	*Germany*	28·60	46·42	62·15	46·38	45·88	39·85	33·55	10	Sunrise, 2—3.
Deutschbrod .	*Bohemia*	27·58	45·35	62·56	47·37	45·72	39·40	34·98	12	Sunrise, 2—3.
Herzogenaurach	*Germany*	31·97	48·80	66·12	48·62	48·88	38·89	34·15	11	10, 4.
Pilsen . . .	*Bohemia*	27·99	48·04	64·83	47·82	47·17	42·10	36·84	9	Sunrise, 2—3.
Treves . . .	*Germany*	34·64	48·28	64·60	51·74	49·81	34·36	29·96	9	7, 2, 9.
Würzburg . .	*Germany*	33·56	51·62	67·39	50·57	50·79	35·79	33·83	20	7, 2, 9.
Brzezina . .	*Bohemia*	27·68	45·03	61·09	45·57	44·85	38·91	33·41	6	Sunrise, 2—3.
Zbirow . . .	*Bohemia*	28·24	45·32	61·59	45·86	45·25	39·35	33·35	3	Sunrise, 2—3.
Kuttenplan .	*Bohemia*	31·97	49·33	60·04	46·59	45·73	33·35	28·07	1	Sunrise, 2—3.
Landscron . .	*Galicia*	26·69	45·69	63·89	46·72	45·75	42·60	37·20	18	Sunrise, 2—3.

Mean Temperature of each Month.

Lat. 49° 56′ to 50° 33′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
La Chapelle .	*France*	49 56 N.	1 5 E.	. .	37·54	38·39	43·66	48·70	53·20	58·91	60·85	62·29	58·69	51·85	48·16	38·98
Bayreuth . .	*Germany*	49 57 N.	11 35 E.	1115	26·91	30·51	38·14	47·66	54·57	59·88	62·92	62·06	55·47	46·76	37·94	32·69
Aschaffenburg	*Germany*	49 58 N.	9 10 E.	390	35·42	36·46	41·45	46·42	59·11	65·75	67·75	65·08	59·54	51·28	42·28	37·96
Tepl . . .	*Bohemia*	49 58 N.	12 52 E.	2144	22·71	27·07	34·75	43·79	50·88	56·48	60·44	58·84	52·93	45·01	35·02	29·79
Marienbad. .	*Bohemia*	49 59 N.	12 42 E.	2027	20·75	19·85	30·83	42·89	48·97	55·65	61·16	55·49	53·62	41·52	27·16	13·84
Cracow . .	*Poland*	50 4 N.	19 51 E.	647	23·94	28·15	36·30	47·77	58·57	65·37	67·03	65·77	59·00	47·53	36·21	29·48
Prague . .	*Bohemia*	50 5 N.	14 24 E.	621	27·61	31·39	40·87	52·61	60·49	65·95	69·62	68·56	61·81	50·29	39·92	33·53
Eger . . .	*Bohemia*	50 5 N.	12 22 E.	1451	32·20	26·78	34·97	45·95	55·38	60·42	64·29	61·79	55·33	46·45	34·32	32·
Penzance . .	*Cornwall*	50 7 N.	5 33 W.	. .	42·62	44·90	45·32	48·07	54·54	59·52	62·10	61·11	57·11	53·36	47·54	45·16
Helston . .	*Cornwall*	50 7 N.	5 18 W.	106	42·09	44·10	46·35	48·93	52·98	60·05	62·07	61·52	58·76	53·42	48·33	45·08
Falmouth . .	*Cornwall*	50 8 N.	5 2 W.	. .	41·05	43·35	44·65	48·65	54·30	56·75	60·75	58·80	56·85	53·20	46·70	42·70
Frankfort . .	*Germany*	50 10 N.	8 37 E.	351	31·46	36·68	41·54	49·10	57·74	63·50	66·07	65·73	59·41	49·24	40·96	34·25
Cambray . .	*France*	50 11 N.	3 14 E.	213	38·75	40·33	44·83	52·70	60·35	68·	68·23	67·55	62·60	50·90	40·33	38·75
Smetschna . .	*Bohemia*	50 11 N.	16 22 E.	1150	24·93	28·69	36·19	45·79	55·29	62·44	65·46	63·52	57·11	47·44	37·36	29·68
Königgrätz .	*Bohemia*	50 13 N.	15 48 E.	760	24·75	25·54	35·62	44·62	54·61	62·47	65·19	61·99	57·02	47·44	36·16	29·50
Carlsbad . .	*Bohemia*	50 14 N.	12 53 E.	. .	26·31	28·83	34·03	44·49	54·14	63·86	64·00	63·23	58·69	48·02	38·71	27·97
Coburg . .	*Germany*	50 15 N.	10 58 E.	1685	28·92	32·14	35·15	45·05	54·82	61·50	63·75	63·34	56·82	46·22	37·02	30·11
Truro . . .	*Cornwall*	50 17 N.	5 4 W.	. .	40·20	42·60	43·80	47·30	54·60	57·05	61·45	59·85	56·80	53·20	48·05	46·25
Zlonitz. . .	*Bohemia*	50 17 N.	14 6 E.	613	25·74	30·13	39·47	48·81	58·28	63·23	66·83	66·45	59·43	50·50	39·11	34·79
Hoff . . .	*Germany*	50 19 N.	11 57 E.	1625	25·90	29·59	34·09	40·44	52·77	60·58	62·02	59·47	54·41	45·68	35·98	32·45
Saaz . . .	*Bohemia*	50 20 N.	13 30 E.	842	25·88	31·14	39·54	47·80	57·85	62·85	67·15	64·83	58·44	49·42	37·54	32·79
Turtsch . .	*Germany*	50 23 N.	17 34 E.	1847	21·92	26·13	35·58	41·05	50·50	60·19	61·93	62·13	55·40	46·58	33·85	29·82
Oberwiesenthal	*Bohemia*	50 25 N.	12 58 E.	2963	26·35	30·69	33·58	41·90	51·13	57·58	58·96	58·87	52·75	45·12	33·76	28·62
Schössl. . .	*Germany*	50 27 N.	13 30 E.	. .	25·20	28·80	29·37	41·63	53·49	62·31	63·39	60·10	56·64	44·85	36·55	24·75
Torquay . .	*Devon*	50 27 N.	3 29 W.	. .	41·15	45·45	45·15	48·70	58·85	59·20	63·30	61·10	57·60	53·85	48·15	45·80
Rotenhaus .	*Bohemia*	50 31 N.	15 47 E.	1285	25·27	28·08	37·40	46·58	56·03	62·76	66·02	63·77	57·36	48·22	35·44	31·46
Leitmeritz. .	*Bohemia*	50 32 N.	14 8 E.	383	26·28	30·47	37·22	47·53	58·37	64·29	66·56	66·	59·09	48·97	39·11	29·84
Schüttenitz .	*Bohemia*	50 33 N.	14 10 E.	751	26·01	29·50	39·22	49·28	58·39	64·67	67·71	66·79	60·17	50·09	37·99	33·01

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
La Chapelle .	*France*	38·30	48·52	60·68	52·90	50·10	24·75	22·38	3	9, 9.
Bayreuth . .	*Germany*	29·84	46·78	61·61	46·72	46·24	36·01	31·77	18	7, 1, 9.
Aschaffenburg	*Germany*	36·61	48·99	66·20	51·04	50·72	32·33	29·59	7	$6\frac{1}{2}$, 2, $9\frac{1}{2}$.
Tepl . . .	*Bohemia*	26·52	43·14	58·59	44·32	43·14	37·73	32·07	11	Sunrise, 2—3.
Marienbad. .	*Bohemia*	18·15	40·90	57·43	40·77	39·31	47·32	39·28	1	Sunrise, 2—3.
Cracow . .	*Poland*	27·19	47·55	66·06	47·58	47·09	43·09	38·87	20	7, 12, 2, 9, and 6, 2, 10.
Prague . .	*Bohemia*	30·85	51·33	68·05	50·68	50·23	42·01	37·20	$14\frac{1}{2}$	8, 12, 3, 10.
Eger . . .	*Bohemia*	27·33	45·43	62·17	45·37	45·07	41·09	34·84	9	Sunrise, 2—3.
Penzance . .	*Cornwall*	44·23	49·31	60·91	52·67	51·78	19·48	16·68	21	8, 2, red.
Helston . .	*Cornwall*	43·76	49·42	61·21	53·50	51·97	19·98	17·45	8	Daily extremes.
Falmouth . .	*Cornwall*	43·87	49·18	58·77	52·25	51·02	19·70	14·90	$1\frac{3}{4}$	Daily extremes.
Frankfort . .	*Germany*	34·13	49·46	65·10	49·87	49·64	34·61	30·97	20	. .
Cambray . .	*France*	39·27	52·63	67·93	51·28	52·77	29·48	28·66	5	. .
Smetschna .	*Bohemia*	27·77	45·76	63·81	47·30	46·16	40·53	36·04	12	Sunrise, 2—3.
Königgrätz .	*Bohemia*	26·60	44·95	63·22	46·87	45·41	40·44	36·62	13	Sunrise, 2—3.
Carlsbad . .	*Bohemia*	27·70	44·22	63·70	48·47	46·02	37·69	36·00	4	Sunrise, 2—3.
Coburg . .	*Germany*	30·38	45·01	62·87	46·69	46·24	34·83	32·49	12	Morning, 12, evening.
Truro . . .	*Cornwall*	43·01	48·57	59·45	52·68	50·93	21·25	16·44	2	Daily extremes.
Zlonitz. . .	*Bohemia*	30·22	48·85	65·50	49·69	48·56	41·09	35·18	6	Sunrise, 2—3.
Hoff . . .	*Germany*	29·31	42·43	60·69	45·36	44·45	36·12	31·38	7	7, 2, 9.
Saaz . . .	*Bohemia*	29·93	48·40	64·94	48·47	47·93	41·27	35·01	13	Sunrise, 2—3.
Turtsch . .	*Germany*	25·96	42·38	61·42	45·28	43·76	40·21	35·46	3	Sunrise, 2—3.
Oberwiesenthal	*Bohemia*	28·55	42·20	58·47	43·88	43·28	32·61	29·92	5	12.
Schössl . .	*Germany*	26·26	41·50	61·93	46·02	43·93	38·19	35·67	$2\frac{1}{3}$	8, 8.
Torquay . .	*Devon*	44·10	50·90	61·20	53·20	52·35	22·15	17·10	2	Daily extremes.
Rotenhans .	*Bohemia*	28·27	46·67	64·18	47·01	46·53	40·75	35·91	12	Sunrise, 2—3.
Leitmeritz .	*Bohemia*	28·86	47·71	65·62	49·06	47·81	40·28	36·76	9	Sunrise, 2—3.
Schüttenitz .	*Bohemia*	29·50	48·97	66·38	49·42	48·56	41·70	36·88	8	Sunrise, 2—3.

Mean Temperature of each Month.

Lat. 50° 34′ to 50° 59′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Fulda . .	Germany	50 34 N.	9 44 E.	892	25·68	29·01	37·11	48·34	54·43	62·94	66·74	67·24	59·05	46·18	38·71	27·36
Hohenelb .	Bohemia	50 38 N.	15 32 E.	1492	24·01	27·09	33·57	42·82	52·43	58·39	60·96	59·52	54·41	46·22	34·99	29·12
Liège . .	Belgium	50 39 N.	5 32 E.	. .	37·40	41·54	43·70	50·90	59·	63·68	67·82	66·56	60·80	54·50	45·50	40·64
Sidmouth .	Devon	50 41 N.	3 13 W.	. .	36·3	42·0	45·	51·	56·	61·	65·5	65·	61·5	53·	46·	43·
Ilmenau .	Germany	50 41 N.	10 57 E.	1513	32·11	30·69	31·89	49·87	54·77	60·28	64·47	64·06	59·50	47·51	39·54	38·55
St. Peter .	Bohemia	50 41 N.	15 38 E.	2664	23·27	26·08	33·26	43·50	49·19	55·36	59·70	57·07	51·89	44·47	32·70	27·34
Exeter . .	Devon	50 44 N.	3 33 W.	140	37·80	41·70	43·80	47·50	56·05	58·55	62·65	60·80	56·10	52·20	44·95	42·75
Boulogne .	France	50 44 N.	1 30 E.	. .	37·06	41·34	46·36	53·25	60·01	65·41	67·06	69·13	64·36	56·82	50·11	42·35
Isle of Wight .		50 45 N.	1 15 W.	. .	37·	41·	44·	46·	56·	62·	65·	62·	58·	51·	44·	39·
Altenberg .	Germany	50 45 N.	13 43 E.	2472	23·85	29·48	33·22	43·48	54·28	58·73	61·03	59·74	52·84	46·15	33·55	28·96
Orenburg .	Russia	50 46 N.	55 6 E.	234	0·79	9·86	21·22	43·41	54·48	63·77	67·17	61·03	45·52	33·94	17·15	2·34
Gosport .	Hampshire	50 47 N.	1 7 W.	. .	38·99	41·38	44·89	49·88	55·64	61·04	64·03	63·16	59·34	53·71	47·27	42·55
Bodenbach	Bohemia	50 47 N.	14 10 E.	419	24·01	26·62	33·96	42·94	54·86	63·39	64·72	64·47	59·05	49·78	39·34	31·03
Tetschen .	Bohemia	50 47 N.	14 12 E.	316	26·17	29·32	37·69	47·35	57·18	64·13	67·12	64·81	59·32	49·53	38·80	31·12
Arnstadt .	Germany	50 50 N.	10 57 E.	959	30·36	30·22	39·02	49·57	57·49	63·12	67·03	65·53	58·33	49·75	38·30	34·18
Marburg .	Germany	50 50 N.	8 41 E.	. .	29·88	32·81	39·56	47·82	56·17	62·94	63·10	57·94	57·36	47·84	38·14	34·84
Chichester.	Sussex	50 50 N.	0 46 W.	. .	35·20	38·25	42·15	47·05	56·40	57·15	61·70	59·05	54·50	51·50	43·90	41·30
Brussels .	Belgium	50 51 N.	4 22 E.	279	35·29	39·36	42·78	47·28	57·07	63·30	64·38	64·42	59·29	51·76	43·75	39·38
Louvain .	Belgium	50 53 N.	4 42 E.	. .	32·18	34·70	40·82	47·12	56·66	63·14	63·86	64·76	58·28	49·10	41·72	36·50
Zittau . .	Germany	50 54 N.	14 48 E.	820	25·83	30·29	32·47	45·88	53·98	61·05	62·92	60·91	56·53	48·29	36·01	30·51
Alost . .	Belgium	50 56 N.	4 1 E.	. .	32·90	36·68	41·36	46·94	56·30	64·22	67·28	65·84	58·82	50·00	42·80	35·60
Gotha . .	Germany	50 56 N.	10 44 E.	1013	24·73	31·26	38·91	48·22	58·24	64·83	69·82	65·98	59·16	50·65	37·51	31·17
Jena . .	Germany	50 56 N.	11 37 E.	536	32·00	35·35	38·53	50·70	59·38	64·40	66·94	63·57	58·57	49·87	41·45	33·55
Neustadt .	Germany	50 56 N.	14 14 E.	1578	21·42	27·66	30·96	40·73	49·84	53·96	55·31	54·30	49·01	43·27	30·67	31·48
Wesenstein	Germany	50 56 N.	13 51 E.	546	26·37	33·85	42·19	54·61	58·51	64·38	67·06	68·09	59·41	54·50	41·41	35·02
Rumburg .	Bohemia	50 57 N.	14 33 E.	1243	22·89	24·75	37·60	46·13	54·59	61·00	65·28	63·59	56·26	48·56	33·46	33·53
Erfürt . .	Germany	50 59 N.	11 2 E.	676	29·39	33·55	37·74	47·68	57·79	64·06	67·03	65·48	60·69	47·39	38·95	30·45
Eisenach .	Germany	50 59 N.	10 20 E.	676	36·10	36·19	34·39	51·17	57·70	62·29	66·63	64·99	60·76	48·76	42·73	40·01

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Fulda . .	*Germany*	27·35	46·63	65·64	47·98	46·90	41·56	38·29	11	7, 2, 9.
Hohenelb .	*Bohemia*	26·74	42·87	59·62	45·21	43·61	36·95	32·88	19	Sunrise, 2—3.
Liège . .	*Belgium*	39·86	51·20	66·02	53·60	52·67	30·42	26·16	4½	9, 9.
Sidmouth .	*Devon*	40·43	50·66	63·83	53·50	52·10	29·20	23·40	3	Daily extremes.
Ilmenau .	*Germany*	33·78	45·51	62·94	48·87	47·78	33·78	29·16	1	8, 2, 8.
St. Peter .	*Bohemia*	25·56	41·99	57·38	43·03	41·99	36·43	31·82	4	Sunrise, 2—3.
Exeter . .	*Devon*	40·75	49·12	60·66	51·08	50·40	24·85	19·91	2	Daily extremes.
Boulogne .	*France*	40·25	53·21	67·20	57·10	54·44	32·07	26·95	4	. .
Isle of Wight .		39·	48·67	63·	51·	50·42	28·	24·	10	9.
Altenberg .	*Germany*	27·43	43·66	59·83	44·17	43·77	37·18	32·40	5	9, 12, 3.
Orenburg .	*Russia*	4·33	39·70	63·99	32·20	35·06	66·38	59·66	8	S. 5, 2, 9, W. 6, 8, 2, 9.
Gosport .	*Hampshire*	40·97	50·14	62·74	53·44	51·82	25·04	21·77	16	Daily extremes.
Bodenbach	*Bohemia*	27·23	43·93	64·20	49·39	46·18	40·71	36·97	3	Sunrise, 2, 9.
Tetschen .	*Bohemia*	28·87	47·41	65·35	49·22	47·71	40·95	36·48	13	Sunrise, 2—3.
Arnstadt .	*Germany*	31·59	48·70	65·23	48·79	48·58	36·81	33·64	10	8, 2, 8.
Marburg .	*Germany*	32·51	47·85	61·33	47·78	47·37	33·22	28·82	11	7, 1, 9.
Chichester .	*Sussex*	38·25	48·53	59·30	49·90	49·01	26·50	21·05	2	Daily extremes.
Brussels .	*Belgium*	38·01	49·04	64·04	51·60	50·68	29·13	26·63	10	Daily extremes.
Louvain .	*Belgium*	34·46	48·20	63·92	49·70	49·07	32·58	29·46	8	Daily extremes.
Zittau . .	*Germany*	28·87	44·11	61·63	46·94	45·39	37·09	32·76	10	9, 11, 3.
Alost . .	*Belgium*	35·06	48·20	65·77	50·54	49·89	34·38	30·71	6	Daily extremes.
Gotha . .	*Germany*	29·05	48·46	66·88	49·11	48·37	45·09	37·83	8	Sunrise, 6, 8, 2, 8, red.
Jena . .	*Germany*	33·63	49·54	64·97	49·96	49·53	34·94	31·34	19	8, 2, 8.
Neustadt .	*Germany*	26·85	40·51	54·52	40·98	40·72	33·89	27·67	2	Noon.
Wesenstein	*Germany*	31·86	51·78	66·52	51·78	50·47	41·36	34·66	3	12.
Rumburg .	*Bohemia*	27·06	46·11	63·29	46·09	45·64	42·39	36·23	2	Sunrise, 2—3.
Erfürt . .	*Germany*	31·13	47·74	65·52	49·01	48·35	37·64	34·39	8	7, 2, 9.
Eisenach .	*Germany*	37·43	47·75	64·64	50·75	50·14	30·53	27·21	1	8, 2, 8.

Mean Temperature of each Month.

Lat. 51° 1′ to 51° 38′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Schluckenau .	*Bohemia*	51 1 N.	14 27 E.	1055	25·54	30·11	36·07	46·36	55·87	62·11	64·99	62·98	55·24	47·77	37·02	32·74
Schöndorf . .	*Germany*	51 1 N.	11 20 E.	1065	32·00	27·95	30·99	45·86	55·35	56·62	63·19	62·80	58·17	46·76	39·00	38·86
Schuttenhofen .	*Bohemia*	51 1 N.	14 27 E.	1083	27·09	34·09	38·19	45·95	55·33	59·68	62·94	63·16	58·73	49·62	40·66	33·87
Dunkirk . .	*France*	51 2 N.	2 22 E.	. .	41·00	39·43	43·70	49·10	54·73	64·18	65·75	64·63	60·80	52·25	42·58	40·55
Mechlin . .	*Belgium*	51 2 N.	4 29 E.	. .	30·38	32·51	44·21	56·84	66·20	72·50	75·92	74·84	69·44	55·58	42·98	33·26
Ghent . . .	*Belgium*	51 3 N.	3 43 E.	. .	33·80	35·96	42·08	49·82	60·80	65·66	65·66	67·64	60·98	50·00	41·90	36·14
Dresden . .	*Germany*	51 3 N.	13 44 E.	390	29·19	33·31	39·92	49·60	58·33	65·17	67·48	65·35	58·26	50·05	38·84	33·69
Görlitz . . .	*Germany*	51 9 N.	14 59 E.	682	12·69	21·42	36·64	43·07	55·15	61·21	63·21	58·33	58·28	45·10	33·60	29·59
Uralsk . . .	*Russia*	51 11 N.	51 22 E.	. .	4·28	0·22	13·46	36·68	56·66	70·34	78·44	67·28	64·40	43·34	27·68	7·88
Mühlhausen .	*Germany*	51 13 N.	10 27 E.	. .	14·02	21·22	36·97	40·75	51·06	60·42	61·05	64·54	53·96	48·72	39·85	34·57
Düsseldorf .	*Germany*	51 14 N.	6 47 E.	90	35·06	39·09	44·24	52·16	60·24	64·65	66·54	65·66	60·42	52·00	44·04	37·04
Nertchinsk .	*Russia*	51 18 N.	119 20 E.	2238	23·58	9·63	9·50	32·	47·98	59·	64·40	59·90	47·98	27·05	1·17	17·28
Wartenberg .	*Germany*	51 19 N.	17 41 E.	564	25·54	29·19	36·41	47·91	55·72	61·79	64·90	63·84	56·64	47·84	37·78	30·92
Leipzig . .	*Germany*	51 20 N.	12 22 E.	. .	29·66	33·22	37·96	45·19	54·01	59·65	62·13	58·98	57·67	47·46	38·44	32·50
Arolsen . .	*Germany*	51 23 N.	8 57 E.	. .	30·33	34·12	39·88	46·96	53·58	59·41	62·17	59·59	55·94	49·66	40·15	36·23
Beckington	*Somersetshire*	51 24 N.	2 22 W.	265	35·05	38·00	39·50	45·15	55·20	56·45	61·35	57·55	52·50	48·45	41·35	40·75
Allstedt . .	*Germany*	51 25 N.	11 24 E.	639	37·81	36·77	37·51	50·99	58·75	64·29	67·35	66·04	61·50	50·92	43·77	42·78
Bristol .	*Gloucestershire*	51 27 N.	2 36 W.	. .	36·	40·	43·	51·	57·	61·	67·	65·	57·	49·	49·	45·
Chiswick . .	*Middlesex*	51 29 N.	0 18 W.	. .	36·60	39·56	42·81	47·53	54·22	60·85	63·23	62·18	57·23	50·51	43·41	39·85
Greenwich . .	*Kent*	51 29 N.	. .	156	35·45	37·34	44·64	46·43	54·06	58·55	59·65	62·66	58·02	47·42	42·92	40·37
London . .	*Middlesex*	51 30 N.	0 5 W.	. .	37·35	40·58	43·24	48·42	55·53	61·06	64·09	63·65	59·13	51·97	44·39	40·57
,, (Environs)		. .	. .	. .	35·14	39·00	42·03	47·57	54·94	59·61	63·19	61·95	57·19	50·12	42·43	38·34
Middleburg .	*Holland*	51 30 N.	3 30 E.	. .	36·86	36·64	37·83	47·14	57·94	62·49	65·41	64·15	61·63	50·74	41·11	31·17
Halle . . .	*Germany*	51 30 N.	11 57 E.	362	26·89	31·32	39·65	47·17	55·69	61·32	66·61	62·85	58·57	48·40	37·55	36·30
Göttingen . .	*Germany*	51 32 N.	9 56 E.	450	28·40	33·51	40·87	50·99	64·29	72·32	75·54	73·49	65·82	53·02	40·12	35·47
Breda . . .	*Holland*	51 35 N.	4 47 E.	. .	31·59	36·25	42·22	48·43	58·33	59·29	63·37	65·93	59·97	50·52	43·16	37·36
Tottenham .	*Middlesex*	51 36 N.	0 5 W.	. .	35·14	39·00	42·03	45·57	54·94	59·61	63·19	61·95	57·19	50·12	42·43	38·34
Bushey Heath .	*Herts.*	51 38 N.	0 22 W.	520	36·25	38·23	41·76	48·20	53·18	60·30	63·00	62·17	56·91	50·01	44·09	38·01

Mean Temperature of each Season, and the whole Year.

	Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
	°	°	°	°	°	°	°		
Schluckenau . *Bohemia*	29·46	46·11	63·37	46·67	46·40	39·45	33·91	5	Sunrise, 2—3.
Schöndorf . . *Germany*	32·95	43·41	60·87	47·98	46·29	35·24	27·92	1	8, 2, 8.
Schuttenhofen. *Bohemia*	31·68	46·49	61·93	49·66	47·44	36·07	30·25	4	Sunrise, 2—3.
Dunkirk . . *France*	40·33	49·18	64·85	51·88	51·56	26·32	24·52	3	. .
Mechlin . . *Belgium*	32·04	55·84	74·41	56·01	54·72	45·54	42·36	10	. .
Ghent . . . *Belgium*	35·30	50·90	66·32	50·96	50·87	33·84	31·02	6	Daily extremes.
Dresden . . *Germany*	32·06	49·28	66·00	49·05	49·10	38·29	33·94	11	6, 9, 12, 3, 6, 9.
Görlitz. . . *Germany*	21·23	44·95	60·92	45·66	43·19	50·52	39·69	1	7, 2, 9.
Uralsk. . . *Russia*	3·98	35·60	72·02	45·14	39·19	78·66	68·04	3	8, 12, 4, 8.
Mühlhausen . *Germany*	23·27	42·93	62·00	47·51	43·93	50·52	38·73	1	Hourly.
Düsseldorf . *Germany*	37·06	52·21	65·62	52·15	51·76	31·48	28·56	13	3 times.
Nertchinsk . *Russia*	16·83	29·83	61·10	25·40	24·87	87·98	77·93	4	Hourly, red.
Wartenberg . *Germany*	28·56	46·67	63·50	47·41	46·54	39·36	34·94	15	7, 2, 10.
Leipzig . . *Germany*	31·79	45·72	60·25	47·86	46·41	32·47	28·46	4½	9, 12, 3.
Arolsen . . *Germany*	33·55	46·81	60·40	48·58	47·35	31·84	26·85	17	Sunrise, 12, sunset.
Beckington *Somersetshire*	37·93	46·62	57·66	49·12	47·83	26·30	19·73	2	Daily extremes.
Allstedt . . *Germany*	39·11	49·08	65·89	52·07	51·53	30·58	26·78	1	8, 2, 8.
Bristol. *Gloucestershire*	40·33	50·33	64·33	51·67	51·67	31·00	24·00	1	. .
Chiswick . *Middlesex*	38·67	48·19	62·09	50·39	49·83	26·62	23·41	23	Daily extremes.
Greenwich . *Kent*	37·72	48·38	60·29	49·45	48·96	27·21	22·57	3	2 hourly.
London . . *Middlesex*	39·50	49·06	62·93	51·83	50·83	26·74	23·43	50	Daily extremes.
,, (Environs)	37·49	48·18	61·58	49·91	49·29	28·05	24·09	24	Daily extremes.
Middleburg . *Holland*	34·89	47·64	64·02	51·16	49·43	34·24	29·13	4	7, 2, 9.
Halle . . . *Germany*	31·50	47·50	63·59	48·17	47·69	39·72	32·09	7½	True noon.
Göttingen . . *Germany*	32·46	52·05	73·78	52·99	52·82	47·14	41·32	. .	. .
Breda . . . *Holland*	35·06	49·66	62·87	51·22	49·71	34·34	27·81	5	8, 2.
Tottenham . *Middlesex*	37·49	47·51	61·58	49·91	49·13	28·05	24·09	25	Daily extremes.
Bushey Heath. *Herts.*	37·50	47·71	61·82	50·34	49·34	26·75	24·32	8½	Daily extremes.

Mean Temperature of each Month.

Lat. 51° 40′ to 52° 57′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Zapplan . .	*Germany*	51 40 N.	16 30 E.	374	31·44	35·38	38·75	49·44	55·06	62·94	68·00	66·88	62·38	53·38	43·25	38·46
Sagan . . .	*Germany*	51 42 N.	15 40 E.	. .	25·41	26·71	32·83	45·66	55·24	63·43	65·98	64·85	57·11	47·82	35·26	29·55
Oxford. .	*Oxfordshire*	51 46 N.	1 16 W.	. .	36·9	37·1	47·1	46·7	52·7	58·7	61·6	60·8	57·1	49·4	43·6	37·0
Guben . . .	*Germany*	51 46 N.	14 40 E.	. .	27·63	32·07	39·85	50·27	58·62	65·30	69·04	66·65	59·61	50·86	41·52	37·47
Brocken . .	*Germany*	51 48 N.	10 37 E.	3741	9·03	17·49	26·49	28·42	41·27	47·53	50·29	45·07	46·76	37·92	27·59	24·93
Cheltenham .	*Gloucester*	51 54 N.	2 4 W.	. .	38·25	41·75	46·18	50·50	54·16	61·50	66·33	65·12	59·06	50·32	43·50	41·75
Schiedam . .	*Holland*	51 55 N.	4 24 E.	. .	34·90	36·86	41·37	47·29	54·53	59·50	62·47	62·35	58·45	51·65	44·06	39·51
Münster . .	*Germany*	51 58 N.	7 38 E.	. .	33·33	37·51	39·90	47·46	55·87	60·96	63·25	62·51	57·85	50·02	42·64	37·09
Arnheim . .	*Holland*	51 59 N.	5 55 E.	64	33·10	36·51	40·12	48·19	56·22	59·91	63·62	63·13	57·56	49·19	41·01	35·19
Falkland Is. .	*S. America*	52 0 S.	0 61 W.	. .	56·	54·	51·61	48·65	46·64	43·5	37·41	38·64	45·75	47·51	47·2	49·87
Hague . . .	*Holland*	52 4 N.	4 19 E.	. .	34·70	39·88	45·05	51·13	57·20	63·05	66·43	67·10	61·70	54·05	43·93	40·10
Utrecht . .	*Holland*	52 5 N.	5 8 E.	. .	36·54	39·09	42·90	49·27	56·55	62·52	65·33	64·64	60·36	51·05	42·25	39·68
Salzuflen . .	*Germany*	52 5 N.	8 40 E.	. .	30·92	35·60	40·69	47·66	55·81	62·38	64·54	62·58	58·01	49·73	40·06	37·51
Bedford .	*Bedfordshire*	52 8 N.	0 30 W.	. .	38·08	41·68	45·26	49·89	58·16	61·11	64·31	62·61	58·03	53·46	45·26	41·77
Leyden . .	*Holland*	52 9 N.	4 29 E.	. .	33·97	36·52	39·89	46·18	54·16	61·00	63·87	63·29	58·94	49·92	42·75	37·98
Rinteln . .	*Germany*	52 11 N.	9 5 E.	. .	30·29	34·39	38·98	49·06	55·45	63·50	64·65	62·85	58·24	51·04	40·57	37·45
Warsaw . .	*Poland*	52 13 N.	21 1 E.	373	22·28	25·79	31·17	42·91	55·09	60·89	64·63	64·11	56·03	45·07	35·15	26·67
Brunswick .	*Germany*	52 15 N.	10 32 E.	319	27·50	37·18	36·88	48·54	55·29	61·86	68·81	66·45	57·18	51·08	45·77	42·46
Irkoutsk . .	*Russia*	52 17 N.	104 17 E.	1421	–3·30	4·77	20·03	36·19	49·66	60·49	64·85	59·16	47·50	33·91	16·90	1·22
Amsterdam .	*Holland*	52 23 N.	4 53 E.	. .	33·19	36·82	40·74	48·13	55·69	62·52	65·34	65·30	60·61	51·14	41·92	36·88
Haarlem . .	*Holland*	52 23 N.	4 39 E.	. .	34·32	37·29	40·82	47·62	55·06	59·68	62·82	63·28	58·84	51·43	43·00	38·25
Zwanenburg .	*Holland*	52 23 N.	4 46 E.	. .	34·24	37·06	40·69	47·31	54·79	60·03	63·44	63·81	59·67	51·38	42·91	37·81
Berlin . . .	*Germany*	52 30 N.	13 24 E.	106	27·72	31·66	38·17	47·48	56·57	63·37	65·84	64·47	58·44	49·93	39·31	34·97
Lyndon .	*Rutlandshire*	52 32 N.	0 41 W.	510	35·20	38·13	40·59	46·91	53·80	60·33	63·53	61·87	56·30	48·82	40·98	37·43
Tambow . .	*Russia*	52 47 N.	41 28 E.	202	12·32	17·49	27·41	42·43	55·56	63·88	67·51	63·77	52·79	40·98	28·13	17·13
Boston . .	*Lincolnshire*	52 48 N.	0 5 W.	. .	35·97	37·31	41·67	47·52	55·52	61·63	63·01	61·29	54·02	49·25	42·34	39·94
Derby . .	*Derbyshire*	52 55 N.	1 28 W.	39	34·75	38·55	41·50	45·10	55·65	57·00	62·30	57·75	53·20	49·90	43·05	40·90
Highfield House	*Notts.*	52 57 N.	1 10 W.	103	34·90	40·10	43·55	45·75	58·65	60·45	65·00	60·40	55·15	51·40	44·05	42·65

Mean Temperature of each Season, and the whole Year.

	Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
	°	°	°	°	°	°	°		
Zapplan . . *Germany*	35·08	47·75	65·93	52·99	50·45	36·56	30·85	1	7, 2, 9.
Sagan . . . *Germany*	27·23	44·58	64·76	46·74	45·82	40·57	37·53	7	7, 2, 9.
Oxford . . *Oxfordshire*	37·	47·17	60·37	50·03	48·64	24·70	23·37	2	10, 10.
Guben . . . *Germany*	32·39	49·58	67·00	50·66	49·91	41·41	34·61	8	6, 2, 9.
Brocken . . *Germany*	17·15	32·07	47·64	37·42	33·58	41·26	30·49	$1\frac{1}{2}$	. .
Cheltenham . *Gloucester*	40·60	50·28	64·32	50·96	51·54	28·08	23·72	3	Reduced.
Schiedam . . *Holland*	37·09	47·73	61·44	51·39	49·41	27·57	24·35	25	8, 2, 8, red.
Münster . . *Germany*	35·98	47·74	62·24	50·17	49·03	29·92	26·26	$10\frac{1}{3}$	6, 2, 10.
Arnheim . . *Holland*	34·93	48·18	62·22	49·25	48·65	30·52	27·29	29	7, 1, 10, red.
Falkland Is. *S. America*	53·29	48.97	39·85	46·82	47·23	18·59	13·44	1	. .
Hague . . . *Holland*	38·23	51·13	65·53	53·23	52·03	32·40	27·30	8	7, 8, 2, 6, 10.
Utrecht . . *Holland*	38·44	49·57	64·16	51·22	50·85	28·79	25·72	11	7, 12, 11, red.
Salzuflen . . *Germany*	34·68	48·04	63·16	49·26	48·79	33·62	28·48	16	8, 2, 8.
Bedford . *Bedfordshire*	40·51	51·10	62·68	52·25	51·64	26·23	22·17	8	Daily extremes.
Leyden . . *Holland*	36·16	46·74	62·72	50·54	49·04	29·90	26·56	19	$7\frac{1}{2}$, 12, 10, red.
Rinteln . . *Germany*	34·04	47·83	63·67	49·95	48·87	34·36	29·63	3	8, 12, 10, red.
Warsaw . . *Poland*	24·91	43·05	63·21	45·41	41·15	42·35	38·30	. .	. .
Brunswick. . *Germany*	35·71	46·90	65·71	51·34	49·92	41·31	30·00	3	Daily extremes.
Irkoutsk . . *Russia*	0·90	35·29	61·50	32·77	32·62	68·15	60·60	10	7, 2, 9.
Amsterdam . *Holland*	35·63	48·19	64·39	51·22	49·86	32·15	28·76	12	$7\frac{1}{2}$, 2, 10, red.
Haarlem . . *Holland*	36·62	47·83	61·93	51·09	49·37	28·96	25·31	53	8, 1, 10, red.
Zwanenburg . *Holland*	36·37	47·60	62·43	51·32	49·4	29·57	26·06	92	Reduced.
Berlin . . . *Germany*	31·45	47·41	64·56	49·23	48·16	38·12	33·11	24	Daily extremes.
Lyndon . *Rutlandsh.*	36·92	47·10	61·91	48·69	48·65	28·33	24·99	28	Daily extremes.
Tambow . . *Russia*	15·98	41·80	65·05	40·63	40·87	54·19	49·07	13	Daily extremes.
Boston . . *Lincolnshire*	37·74	48·24	61·98	48·54	49·12	27·04	24·24	20	$8\frac{1}{2}$.
Derby . . *Derbyshire*	38·08	47·75	59·01	48·72	48·89	27·55	20·93	2	Daily extremes.
Highfield House *Notts.*	39·21	49·31	61·95	50·20	50·17	30·10	21·74	2	Daily extremes.

Mean Temperature of each Month.

Lat. 52° 58′ to 54° 19′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Königsberg .	*Germany*	52 58 N.	14 27 E.	. .	25·92	30·61	37·78	46·90	55·90	61·74	65·77	64·44	57·56	51·15	38·07	31·78
Bremen .	*Germany*	53 5 N.	8 49 E.	. .	29·58	34·12	39·14	46·27	55·93	61·94	64·62	63·33	57·70	50·13	39·13	35·61
Perleberg .	*Germany*	53 5 N.	11 49 E.	. .	25·92	32·50	38·82	47·35	57·20	62·65	65·71	64·80	55·69	49·01	39·52	35·08
Francker .	*Holland*	53 12 N.	5 31 E.	. .	33·40	37·76	42·82	48·89	56·78	63·91	67·11	66·57	60·97	53·99	43·43	38·39
Luneburg .	*Germany*	53 15 N.	10 30 E.	. .	31·26	35·31	39·85	47·62	55·92	61·88	64·38	62·87	57·07	47·39	41·14	34·57
Barnaul .	*Siberia*	53 20 N.	83 27 E.	400	−5·57	4·32	9·27	33·35	50·68	61·70	67·55	60·35	47·52	33·58	13·55	0·27
Dublin .	*Ireland*	53 21 N.	6 11 W.	. .	39·26	40·72	43·24	48·05	54·37	60·24	61·47	61·40	56·48	50·08	43·69	42·02
Do.	Do.	53 21 N.	6 11 W.	. .	38·49	40·96	42·46	47·00	52·02	57·34	60·71	60·67	55·77	50·00	43·12	40·05
Cuxhaven .	*Germany*	53 21 N.	8 43 E.	. .	31·35	34·05	37·00	45·30	53·69	59·25	63·59	63·64	58·35	49·57	39·81	33·33
Stargard .	*Germany*	53 21 N.	15 0 E.	. .	25·11	27·41	35·06	44·06	56·41	61·77	64·04	65·12	58·75	47·26	37·67	31·17
Neustrelitz	*Germany*	53 22 N.	13 3 E.	320	25·25	32·41	37·00	47·84	56·23	62·71	64·45	62·44	56·48	51·01	38·28	34·63
Liverpool .	*Lancashire*	53 25 N.	2 59 W.	. .	39·95	42·29	44·44	48·06	55·27	60·	61·41	62·	57·87	51·64	45·05	41·67
Manchester	*Lancashire*	53 29 N.	2 14 W.	. .	36·7	39·3	41·8	47·1	53·2	58·2	60·8	60·4	56·3	50·0	42·9	39·0
Crumpsal .	*Lancashire*	53 32 N.	2 14 W.	. .	36·9	38·9	42·2	46·6	52·2	57·6	60·2	59·3	56·7	50·5	43·9	41·1
Altona .	*Germany*	53 33 N.	9 56 E.	. .	34·23	37·90	41·25	52·27	60·31	67·42	70·34	70·43	63·18	53·51	42·91	39·29
Hamburg .	*Germany*	53 33 N.	9 58 E.	. .	30·00	34·41	38·05	46·72	56·84	62·15	64·63	64·38	57·18	48·07	40·24	33·76
Bolton .	*Lancashire*	53 35 N.	2 24 W.	. .	36·8	39·7	42·9	47·0	53·9	59·3	61·6	60·6	55·7	49·9	42·5	39·9
Jever .	*Germany*	53 36 N.	7 54 E.	. .	31·82	33·10	38·41	44·80	54·57	56·12	64·24	63·66	58·71	49·93	39·79	36·48
Port Famine	*S. Amer.*	53 38 S.	70 58 W.	. .	51·10	49·37	41·22	35·47	32·97	33·03	33·25	. .	. .	. .	. .	. .
Ackworth .	*Yorkshire*	53 39 N.	1 20 W.	. .	35·73	38·18	41·60	45·85	51·70	57·92	60·72	59·51	54·95	49·47	41·79	39·86
Swinemünde	*Germany*	53 54 N.	14 17 E.	. .	25·63	26·04	37·09	46·63	54·84	61·75	67·37	64·49	59·36	49·33	38·73	37·69
Cumberland House	*N. Am.*	53 57 N.	102 17 W.	. .	−13·2	−1·1	12·1	35·	50·	58·8	61·8	56·2	47·	36·9	13·	3·2
Lancaster .	*Lancashire*	54 3 N.	2 48 W.	. .	36·55	38·07	37·22	44·27	51·15	55·74	57·71	57·05	54·34	47·31	40·30	36·62
New Malton	*Yorkshire*	54 8 N.	0 47 W.	85	35·27	37·00	40·71	46·39	52·44	57·64	61·10	58·60	55·25	47·61	42·45	36·63
Elbing .	*Germany*	54 9 N.	19 26 E.	. .	26·17	29·55	35·11	44·44	54·82	61·45	63·93	62·71	57·56	47·66	36·75	30·85
Isle of Man	—	54 12 N.	4 30 W.	. .	40·52	41·05	43·41	46·77	52·13	57·02	60·33	59·60	55·89	51·17	46·80	43·43
Kendal .	*Westmoreland*	54 17 N.	2 46 W.	130	33·97	37·70	40·52	44·92	52·06	56·87	58·99	57·51	53·40	48·34	40·83	39·45
Stralsund .	*Germany*	54 19 N.	13 5 E.	51	26·24	29·48	35·44	45·40	54·61	61·88	63·93	62·37	57·33	50·77	38·70	34·21

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Königsberg .	Germany	29·44	46·86	63·98	48·93	47·30	39·85	34·59	1	5 times red.
Bremen .	. Germany	33·10	47·11	63·30	48·99	48·13	35·04	30·20	12	. .
Perleberg .	. Germany	31·17	47·79	64·39	48·07	47·85	39·79	33·22	5	8, 12, 2, 6, 10, red.
Francker .	. Holland	36·52	49·50	65·86	52·80	51·17	33·71	29·34	13	6, 10, 2, 6, 10, red.
Luneburg .	. Germany	33·71	47·80	63·04	48·53	48·27	33·12	29·33	12	. .
Barnaul .	. Siberia	—0·33	31·10	63·21	31·55	31·37	73·12	63·54	6	Hourly red.
Dublin .	. Ireland	40·67	48·55	61·07	50·08	50·09	22·21	20·40	17	. .
Do.	Do.	39·83	47·16	59·57	49·63	49·05	22·22	19·74	6	Daily extremes.
Cuxhaven .	. Germany	32·92	45·33	62·16	49·24	47·41	32·29	29·24	18	. .
Stargard .	. Germany	27·90	45·18	63·64	47·89	46·15	40·01	35·74	6	$7\frac{1}{2}$, $1\frac{1}{2}$, $9\frac{1}{2}$.
Neustrelitz	. Germany	30·76	47·01	63·19	48·61	47·39	39·20	32·43	5	8, 12, 2, 6, 10.
Liverpool .	Lancashire	41·30	49·26	61·14	51·52	50·80	22·05	19·84	25	12.
Manchester	Lancashire	38·33	47·37	59·80	49·73	48·81	24·10	21·47	47	8, 1, 11.
Crumpsal .	Lancashire	38·97	47·	59·03	50·37	48·84	23·30	20·06	8	Daily extremes.
Altona .	. Germany	37·13	51·18	69·40	53·20	52·75	36·20	32·27	$3\frac{1}{3}$	12.
Hamburg .	. Germany	32·72	47·20	63·72	48·50	48·04	34·63	31·00	18	$\frac{1}{3}(2·8 + 2)$.
Bolton .	Lancashire	38·80	47·93	60·50	49·37	49·15	24·80	21·70	10	. .
Jever . .	. Germany	33·80	45·93	61·34	49.48	47·64	32·42	27·54	$9\frac{1}{2}$	9.
Port Famine	. S. Amer.	. .	42·02	33·08	. .	. .	. .	. .	$\frac{1}{2}$	6, 9, 12, 3, 6.
Aekworth .	. Yorkshire	37·92	46·38	59·38	48·74	48·11	24·99	21·46	18	Daily extremes.
Swinemünde	. Germany	29·79	46·19	64·54	49·14	47·41	41·74	34·75	4	8, 12, 2, 6, 10.
Cumberland H.	N. Amer.	—3·70	32·37	58·93	32·30	29·98	75·00	62·63	1	. .
Lancaster .	Lancashire	37·08	44·21	56·83	47·32	46·36	21·16	19·75	7	10, reduced.
New Malton	. Yorkshire	36·30	46·51	59·11	48·44	47·59	25·83	22·81	$8\frac{1}{3}$	Daily extremes.
Elbing . .	. Germany	28·86	44·79	62·70	47·32	45·92	37·76	33·84	14	6, 2, 9.
Isle of Man	. —	41·67	47·44	58·98	51·29	49·84	19·81	17·31	9	9, 11, reduced.
Kendal.	. Westmoreland	37·04	45·83	57·79	47·52	47·05	25·02	20·75	13	Daily extremes.
Stralsund .	. Germany	29·98	45·15	62·73	48·93	46·70	37·69	32·75	11	Reduced.

Mean Temperature of each Month.

Lat. 54° 20′ to 56° 20′.

	Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Braunsberg . *Germany*	54 20 N.	19 54 E.	..	21·18	23·90	32·97	44·40	51·46	59·45	62·02	62·85	56·64	46·29	33·53	27·07
Dantzic . *Germany*	54 20 N.	18 41 E.	..	27·45	30·78	35·24	43·41	52·07	59·27	63·59	62·90	56·08	47·05	38·05	31·80
Keswick . *Cumberland*	54 33 N.	3 9 W.	240	36·36	40·04	39·90	44·38	52·25	56·63	59·48	59·68	53·45	47·77	41·23	36·2
Whitehaven *Cumberland*	54 33 N.	3 33 W.	..	38·47	39·53	41·15	46·22	53·72	58·45	60·60	59·87	55·79	49·86	43·66	41·70
Belfast . . *Ireland*	54 37 N.	5 58 W.	..	40·02	41·42	45·66	50·68	58·30	63·45	64·24	63·85	58·36	51·71	44·82	42·62
Wilna . . *Poland*	54 41 N.	25 18 E.	639	21·54	27·16	33·08	43·54	54·75	63·03	64·33	61·79	55·69	44·92	32·88	25·79
Königsberg . *Germany*	54 43 N.	20 29 E.	72	24·44	26·96	31·46	41·36	51·98	57·38	62·60	61·70	53·60	43·70	35·78	27·14
Durham . . —	54 46 N.	1 34 W.	340	33·95	37·95	40·65	42·55	53·50	55·45	59·90	55·25	51·95	47·85	43·05	40·00
Carlisle . *Cumberland*	54 54 N.	2 58 W.	..	36·19	38·59	40·49	44·82	51·16	55·69	58·48	58·01	53·81	48·09	41·38	36·97
Apenrade . . *Denmark*	55 3 N.	9 25 E.	35	32·14	35·06	37·65	44·11	52·36	58·80	62·74	62·26	56·73	48·27	40·30	33·10
Tilsit . . . *Germany*	55 5 N.	21 45 E.	..	22·32	25·92	32·23	42·51	53·11	60·80	63·50	62·15	54·95	45·28	34·93	28·29
Slatust . . . *Russia*	55 11 N.	59 45 E.	1044	3·83	4·53	14·92	33·76	50·27	60·71	63·14	60·06	44·71	33·53	19·47	1·38
Applegarth . *Dumfries*	55 13 N.	3 12 W.	170	34·06	35·92	38·84	43·27	49·24	54·77	57·09	56·50	52·21	46·35	40·83	38·12
Leadhills . *Lanarkshire*	55 25 N.	3 48 W.	1280	32·	34·8	37·5	42·95	49·65	55·05	57·2	54·95	50·45	44·05	37·5	33·3
Makerstoun *Roxburghsh.*	55 36 N.	2 31 W.	213	32·3	38·6	41·3	44·6	51·6	56·8	55·85	57·55	54·3	44·25	38·05	44·8
Copenhagen . *Denmark*	55 41 N.	12 35 E.	..	29·25	30·54	34·99	42·94	52·68	60·62	64·29	63·19	57·09	49·15	39·85	34·14
Moscow . . *Russia*	55 45 N.	37 38 E.	426	13·57	16·00	26·76	41·72	54·46	62·38	66·40	63·12	53·20	39·49	27·14	16·02
Kasan . . . *Russia*	55 48 N.	49 7 E.	159	3·45	8·10	20·75	36·30	51·55	61·36	64·78	60·87	49·01	37·06	24·66	7·47
Glasgow . *Lanarkshire*	55 51 N.	4 14 W.	..	38·23	39·48	..	45·96	54·96	59·33	61·25	59·78	..	49·97	42·38	41·31
Bonally *Edinburghshire*	55 53 N.	3 16 W.	1100	34·68	35·92	36·70	40·75	47·48	53·50	55·96	54·48	49·86	45·62	38·23	37·38
Colinton *Edinburghshire*	55 55 N.	3 16 W.	364	36·78	38·23	40·31	45·35	52·12	57·29	59·17	58·22	52·98	48·75	40·13	39·87
Edinburgh *Edinburghshire*	55 58 N.	3 11 W.	220	37·38	38·22	40·53	44·18	50·34	56·03	58·69	56·79	53·44	48·79	41·43	39·75
Leith . *Edinburghshire*	55 59 N.	3 10 W.	..	41·09	40·62	40·87	46·38	50·01	56·09	60·36	58·37	56·31	49·23	41·19	39·78
Hopetoun House *Linlithg.*	55 59 N.	3 27 W.	100	34·22	35·74	38·76	44·07	50·61	56·59	58·74	56·96	52·78	45·88	39·44	37·16
Cape Horn. . *S. Amer.*	56 0 S.	0 67 W.	..	..	..	40·01	35·69	..	35·42	..	..	36·68	..	..	43·34
Carbeth . . *Stirlingsh.*	56 0 N.	4 22 W.	480	45·74	38·02	40·22	42·19	50·05	56·39	60·53	59·02	54·50	46·58	42·37	36·18
Dunfermline . *Fifeshire*	56 5 N.	3 26 W.	..	35·71	37·87	39·00	41·85	48·23	53·75	56·85	54·97	50·96	46·41	40·66	36·41
Nijnii Novgorod *Russia*	56 20 N.	43 57 E.	..	19·67	14·36	35·24	47·12	51·26	59·36	69·26	62·24	45·05	38·57	18·95	5·99

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Braunsberg .	*Germany*	24·06	42·94	61·43	45·48	43·48	41·67	37·37	6	8, 12, 10.
Dantzic . .	*Germany*	30·01	43·57	61·92	47·06	45·64	36·14	31·91	32	6, 2, 10.
Keswick .	*Cumberland*	37·53	45·51	58·60	47·48	47·28	23·48	21·07	4⅔	6½, 12—1, 6.
Whitehaven	*Cumberland*	39·90	47·03	59·64	49·77	49·09	22·13	19·74	12	Daily extremes.
Belfast . .	*Ireland*	41·35	51·55	63·85	51·63	52·09	24·22	22·50	6	9, 3.
Wilna . . .	*Poland*	24·83	43·79	63·05	44·50	44·04	42·79	38·22	7	. .
Königsberg .	*Germany*	26·18	41·60	60·56	44·36	43·18	38·16	34·38	24	7, 2, 9.
Durham . .	—	37·30	45·56	56·86	47·62	46·84	25·95	19·56	2	Daily extremes.
Carlisle .	*Cumberland*	37·25	45·49	57·39	47·76	46·97	22·29	20·14	24	8, 1, 9.
Apenrade . .	*Denmark*	33·44	44·71	61·27	48·43	46·96	30·60	27·83	9	Reduced.
Tilsit . . .	*Germany*	25·51	42·62	62·15	45·05	43·83	41·18	36·64	20	6, 2, 10.
Slatust . . .	*Russia*	3·25	32·98	61·30	32·57	32·53	61·76	58·05	8	Reduced.
Applegarth .	*Dumfries*	36·03	43·78	56·12	46·46	45·60	23·03	20·09	19	9, 9.
Leadhills .	*Lanarkshire*	33·37	43·37	55·73	44·00	44·12	25·20	22·36	10	6, 1, reduced.
Makerstoun	*Roxburghsh.*	38·57	45·83	56·73	45·53	46·67	25·25	18·16	1½	Daily extremes.
Copenhagen .	*Denmark*	31·31	43·54	62·70	48·70	46·56	35·04	31·39	63	Reduced.
Moscow . .	*Russia*	15·20	40·98	63·97	39·94	40·02	52·83	48·77	21	8, 2, 10.
Kasan . . .	*Russia*	6·34	36·20	62·39	36·91	35·45	61·33	56·00	10	9, 9.
Glasgow .	*Lanarkshire*	39·67	. .	60·12	. .	. .	23·02	20·45	9	10, reduced.
Bonally	*Edinburghshire*	35·99	41·64	54·65	44·57	44·21	21·28	18·66	5	8, 8.
Colinton	*Edinburghshire*	38·29	45·93	58·23	47·29	47·43	22·39	19·94	5	8, 8.
Edinburgh	*Edinburghsh.*	38·45	45·02	57·17	47·89	47·13	21·31	18·72	17	Daily extremes.
Leith .	*Edinburghshire*	40·49	45·75	58·27	48·91	48·36	19·74	17·78	2	Hourly.
Hopetoun House	*Linlithg.*	35·71	44·48	57·43	46·03	45·91	24·52	21·72	29	9¼, 8½.
Cape Horn .	*S. Amer.*	. .	. .	. .	. .	. .	. .	. .	. .	. .
Carbeth . .	*Stirlingsh.*	36·65	44·15	58·65	47·82	46·82	24·79	22·	4	10, A.M., reduced.
Dunfermline .	*Fifeshire*	36·66	43·03	55·19	46·01	45·22	21·14	18·53	20	9, reduced.
Nijnii Novgorod	*Russia*	13·34	44·54	63·62	34·19	38·92	63·27	50·28	1¼	9, 12, 3, 9.

Mean Temperature of each Month.

Lat. 56° 21′ to 60° 20′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
St. Andrews .	*Fifeshire*	56 21 N.	2 48 W.	70	37·25	40·	42·17	46·03	51·58	57·19	60·35	59·30	55·69	49·56	43·17	40·41
Kinfauns Castle	*Perthsh.*	56 23 N.	3 19 W.	. .	34·54	36·84	38·25	42·33	47·99	54·97	57·42	56·41	51·51	46·04	41·97	39·33
Rosebank .	*Forfarshire*	56 25 N.	. .	. .	31·9	39·6	40·1	44·6	52·4	56·7	58·4	57·8	53·4	47·2	36·1	31·8
Dundee .	*Forfarshire*	56 27 N.	2 57 W.	. .	38·40	42·23	42·20	46·26	61·20	62·56	64·55	63·30	57·56	57·52	44·00	43·54
Tomsk. . .	*Siberia*	56 30 N.	85 10 E.	300	−3·55	2·97	12·20	29·97	46·63	59·45	65·30	58·78	46·18	33·13	6·57	−1·08
Catherinenberg	*Siberia*	56 50 N.	60 40 E.	820	4·32	7·70	16·70	33·13	49·10	59·90	64·63	58·10	45·50	34·70	18·95	2·07
Wexio . . .	*Sweden*	56 53 N.	14 45 E.	458	26·94	28·17	30·67	40·80	53·13	62·22	66·07	63·12	54·30	44·51	35·42	28·62
Sitka . . .	*N. Amer.*	57 3 N.	135 18 W.	. .	34·18	33·60	38·01	40·64	48·18	53·83	57·11	57·79	55·96	46·63	42·89	36·32
Aberdeen	*Aberdeenshire*	57 9 N.	2 5 E.	50	37·82	39·03	42·80	47·57	54·29	58·49	60·47	59·64	56·72	49·97	43·18	40·18
Nain . . .	*N. Amer.*	57 10 N.	61 50 W.	. .	0·95	3·51	7·52	29·97	36·23	42·53	50·18	50·99	44·98	33·98	26·51	6·51
Clunie Manse	*Aberdeensh.*	57 12 N.	2 35 W.	. .	36·46	38·29	41·20	45·65	51·91	57·07	59·59	57·63	53·21	47·67	40·72	38·15
Alford . .	*Aberdeenshire*	57 13 N.	2 45 W.	420	33·30	35·46	37·86	42·56	50·15	55·45	57·46	56·54	51·57	44·11	38·55	37·94
Do.	Do.	57 13 N.	2 45 W.	400	35·47	34·96	38·78	42·97	48·85	53·96	56·06	55·84	51·88	45·03	40·24	37·87
Frederikshaven	*Denmark*	57 27 N.	10 33 E.	. .	30·42	31·10	36·05	40·78	52·25	58·33	61·93	61·03	57·20	48·83	40·10	34·70
Elgin . .	*Morayshire*	57 38 N.	3 16 W.	. .	37·56	39·67	40·53	43·54	51·82	59·53	61·23	60·45	53·35	46·98	40·44	38·11
Dorpat . .	*Russia*	58 23 N.	26 43 E.	213	19·80	24·17	28·33	37·45	51·73	62·20	63·05	63·84	52·03	41·83	30·72	25·95
Wiek . . .	*Caithness*	58 29 N.	3 5 W.	. .	38·57	37·93	41·94	44·04	49·30	53·11	56·47	56·42	54·42	48·32	42·84	39·96
Stromness .	*Orkneys*	58 57 N.	3 18 W.	. .	38·05	38·91	40·78	42·29	48·33	53·03	55·37	54·86	52·36	48·61	42·44	41·08
Sandwick .	*Orkneys*	59 5 N.	3 17 W.	. .	39·87	37·54	40·39	44·40	48·00	52·87	54·18	54·99	52·34	46·11	42·41	41·80
Do.	Do.	59 5 N.	3 17 W.	. .	39·61	37·71	40·70	43·77	48·37	52·72	54·61	55·42	52·23	46·93	43·22	37·91
Stockholm. .	*Sweden*	59 21 N.	18 4 E.	136	24·30	26·67	25·59	36·77	48·27	57·02	63·46	60·80	53·65	44·20	35·38	27·16
Carlstadt . .	*Sweden*	59 23 N.	13 30 E.	191	25·59	28·42	31·26	39·63	50·32	59·34	63·43	60·80	54·19	43·90	35·33	29·75
Bogoslowsk .	*Russia*	59 45 N.	59 59 E.	600	3·65	2·30	12·87	29·52	46·63	60·13	65·98	57·43	44·15	31·77	12·87	−3·10
Upsala. . .	*Sweden*	59 52 N.	17 38 E.	. .	22·73	23·22	27·90	37·09	47·73	55·56	61·39	60·55	52·12	41·95	33·55	25·54
Christiana .	*Norway*	59 55 N.	10 45 E.	74	20·79	21·60	30·11	39·13	50·99	58·73	61·25	59·63	52·77	43·27	31·82	27·16
Petersburg .	*Russia*	59 56 N.	30 18 E.	. .	14·74	18·68	25·50	37·18	48·52	59·95	63·91	61·16	51·31	41·38	30·38	22·57
Helsingfors .	*Finland*	60 10 N.	24 57 E.	. .	17·46	20·75	23·43	33·33	45·52	56·50	60·82	58·24	50·83	42·10	31·77	23·22
Ullenswang .	*Norway*	60 20 N.	6 38 E.	. .	30·74	32·36	34·16	42·44	51·98	57·56	62·42	60·26	53·60	45·50	36·50	32·54

Mean Temperature of each Season, and the whole Year.

	Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
	°	°	°	°	°	°	°		
St. Andrews . *Fifeshire*	39·22	46·59	58·95	49·47	48·56	23·10	19·73	8	10, 10.
Kinfauns Castle *Perthsh.*	36·57	42·87	56·43	46·51	45·59	23·38	19·87	5	Daily extremes.
Rosebank . *Forfarshire*	34·43	45·70	57·63	45·57	45·83	26·60	23·20	1	Daily extremes.
Dundee . *Forfarshire*	41·39	49·89	63·47	53·03	51·94	26·15	22·08	1	Noon.
Tomsk . . *Siberia*	—0·55	29·60	61·18	28·63	29·71	68·85	61·73	5	. .
Catherinenberg *Siberia*	4·71	32·97	60·87	33·06	32·90	62·56	56·16	7	10, 10, hourly.
Wexio . . . *Sweden*	27·91	41·53	63·80	44·74	44·50	39·13	35·89	34	. .
Sitka . . . *N. Amer.*	34·74	42·28	56·24	48·49	45·44	24·19	21·50	2½	Reduced.
Aberdeen *Aberdeenshire*	39·03	48·22	59·53	49·96	49·18	22·65	20·52	8	8.
Nain . . . *N. Amer.*	3·66	24·57	47·90	35·16	27·82	50·04	44·24	3	8, 12, 4, 8.
Clunie Manse *Aberdeensh.*	37·63	46·25	58·10	47·20	47·30	23·13	20·47	16	10, 10.
Alford . *Aberdeenshire*	35·57	43·52	56·48	44·74	45·08	24·16	20·91	10	9½, 8½.
Do. Do.	36·10	43·53	55·28	45·71	45·16	20·59	19·18	9	Daily extremes.
Frederikshaven *Denmark*	32·07	43·03	60·43	48·73	46·06	31·51	28·36	2	Reduced.
Elgin . . *Morayshire*	38·45	45·30	60·40	46·92	47·77	23·67	21·95	3	9, reduced.
Dorpat . . *Russia*	23·31	39·17	63·03	41·53	41·76	44·04	39·72	3	Daily extremes.
Wick . . . *Caithness*	38·82	45·09	55·33	48·53	46·94	18·54	16·51	2	Reduced.
Stromness . . *Orkneys*	39·35	43·80	54·42	47·80	46·34	17·32	15·07	12	10, 10.
Sandwick . . *Orkneys*	39·74	44·26	54·05	46·95	46·25	17·45	14·31	5½	10, 10.
Do. Do.	38·41	44·28	54·25	47·46	46·10	18·81	15·84	7	9½, 8½.
Stockholm . *Sweden*	26·04	38·21	60·43	44·41	42·27	39·16	34·39	50	3 times.
Carlstadt . . *Sweden*	27·92	40·40	61·19	44·47	43·50	37·84	33·27	10	3 times.
Bogoslowsk . *Russia*	0·95	29·68	61·18	29·59	30·36	69·08	60·23	5½	10, 10.
Upsala . . *Sweden*	23·76	37·57	59·17	42·54	40·76	38·66	35·41	18	. .
Christiana. . *Norway*	23·18	40·08	59·88	42·62	41·45	40·46	36·70	7¾	Reduced.
Petersburg . *Russia*	18·66	37·06	61·68	41·02	39·61	49·17	43·02	13	7, 2, 9.
Helsingfors . *Finland*	20·48	34·09	58·52	41·57	38·66	43·36	38·04	11	9, 9.
Ullenswang . *Norway*	31·88	42·86	60·08	45·20	45·01	31·68	28·20	25	. .

Mean Temperature of each Month.

Lat. 60° 24′ to 80° 0′.

		Lat.	Long.	Elev.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		° ′	° ′	Feet.	°	°	°	°	°	°	°	°	°	°	°	°
Bergen	*Norway*	60 24 N.	5 18 E.	..	35·02	36·64	37·58	44·33	51·33	56·55	60·40	58·87	54·37	48·04	40·89	37·29
Abo	*Finland*	60 27 N.	22 26 E.	..	20·64	22·78	25·43	36·34	48·87	60·08	65·50	59·81	51·67	42·58	31·73	22·78
Do.	Do.	..	..	..	21·33	33·79	27·88	35·62	46·24	55·87	61·21	57·34	50·68	42·19	31·75	22·93
Falun	*Sweden*	60 39 N.	15 45 E.	426	18·16	25·50	28·71	39·31	49·51	58·06	61·30	58·51	49·93	45·03	31·46	26·28
Unst	*Shetland Isles*	60 45 N.	1 41 W.	..	40·3	38·75	40·4	42·6	46·2	50·8	52·75	54·5	50·7	43·35	39·	37·
Yakoutsk	*Siberia*	62 1 N.	129 44 E.	..	-15·47	-28·86	-6·43	16·36	36·91	58·28	68·79	58·10	44·11	16·59	-22·41	-34·78
Hernösand	*Sweden*	62 30 N.	17 53 E.	..	16·29	17·06	23·76	32·97	42·40	53·31	58·64	56·26	47·48	39·25	28·49	18·70
Jamtland	*Sweden*	63 0 N.	13 23 E.	..	12·92	14·18	20·30	29·12	41·36	54·14	57·56	54·32	45·68	36·50	32·64	9·68
Woro	*Finland*	63 9 N.	22 0 E.	..	15·24	17·46	23·97	35·04	47·75	57·70	64·09	59·97	49·78	39·20	28·58	20·01
Drontheim	*Norway*	63 26 N.	10 25 E.	..	19·58	26·06	20·66	34·39	50·81	59·77	64·96	59·45	53·87	39·25	27·57	24·53
Umea	*Sweden*	63 50 N.	20 16 E.	..	11·39	14·99	22·19	33·98	43·30	54·50	61·23	56·53	47·71	37·99	26·64	14·04
Reikiavig	*Iceland*	64 8 N.	21 55 W.	..	29·82	28·31	29·86	36·46	44·80	51·58	56·19	52·86	46·45	36·91	30·45	29·41
Godhaab	*Greenland*	64 10 N.	52 24 W.	..	12·38	12·56	15·60	22·01	32·16	39·09	41·92	40·84	35·65	29·84	21·94	17·49
Archangel	*Russia*	64 32 N.	40 33 E.	..	6·57	9·23	21·90	31·39	41·68	55·18	60·82	57·58	47·62	35·22	22·62	12·51
Uleaborg	*Finland*	65 0 N.	25 30 E.	..	5·36	9·14	11·48	24·80	38·30	52·52	59·36	54·32	42·26	32·36	18·68	10·76
Fort Franklin	*N. Amer.*	65 12 N.	123 13 W.	230	-22·34	-16·75	-5·39	12·35	35·18	48·02	52·10	50·56	41·00	22·47	-0·11	-10·89
Winter Island	*Hudson's B.*	66 11 N.	83 11 W.	..	-23·17	-23·99	-10·72	6·48	23·29	23·17	35·36	36·86	31·61	13·25	7·88	-14·24
Eyafiord	*Iceland*	66 30 N.	20 30 W.	..	25·70	18·50	20·66	27·50	36·14	43·52	46·94	46·94	43·16	34·34	25·88	18·32
Enontekeis	*Lapland*	68 30 N.	22 5 E.	1563	0·50	0·51	11·48	26·60	36·50	49·46	59·59	56·05	41·72	27·43	12·24	1·04
Igloolik	*Polar Regions*	69 21 N.	81 53 W.	..	-16·13	-19·58	-19·01	-0·85	25·14	32·16	39·09	33·88	25·09	13·72	-18·65	-28·25
Kafiord	*Norway*	69 58 N.	20 29 E.	75	12·27	22·08	25·72	34·16	39·92	49·91	55·04	55·42	44·08	35·92	22·19	23·85
Boothia Felix	*Pr. Regions*	69 59 N.	92 1 W.	..	-28·69	-32·02	-28·68	-2·59	15·65	34·16	41·26	38·69	25·41	9·07	-5·41	-22·43
Kara	*Nova Zembla*	70 37 N.	57 47 E.	..	-2·88	0·09	-10·68	3·13	17·51	32·95	36·30	37·51	30·02	20·28	3·24	12·42
Seichte Bay	*Nova Zembla*	70 40 N.	58 0 E.	..	9·32	10·29	10·38	10·69	24·30	34·41	37·67	37·72	31·01	23·79	9·63	9·72
Ustjansk	*Siberia*	70 58 N.	138 24 E.	..	-39·48	-31·18	-4·05	6·75	27·95	47·55	58·60	44·62	18·25	-18·58	-25·24	-37·03
Mokoschinn Schar	*Nova Z.*	73 0 N.	57 20 E.	..	4·28	-7·74	4·46	8·26	19·74	34·57	39·97	40·93	31·08	22·26	8·73	-3·42
Port Bowen	*Pr. Regions*	73 14 N.	88 56 W.	..	-28·91	-27·32	-28·38	-6·50	17·57	36·12	36·55	30·54	28·88	10·85	-5·00	-19·05
Melville Is.	*Pr. Regions*	74 47 N.	110 48 W.	..	-31·28	-32·45	-18·19	-8·21	16·82	36·21	42·45	32·59	22·52	-2·83	-21·14	-21·62
Spitzbergen	—	80 0 N.	10 0 E.	..	..	..	..	..	..	33·71	35·98	33·80	..	..	..	..

Mean Temperature of each Season, and the whole Year.

		Winter.	Spring.	Summer.	Autumn.	Year.	Diff. H. & C. months.	Diff. S. & W.	No. of Years' Obs.	Hour of Observation.
		°	°	°	°	°	°	°		
Bergen . .	*Norway*	36·32	44·42	58·60	47·77	46·78	25·38	21·28	6	. .
Abo . . .	*Finland*	22·07	36·88	61·80	41·99	40·68	44·86	39·73	10	6, 2, 10.
Do.	Do.	22·68	36·58	58·14	41·54	39·74	39·88	35·46	7	Daily extremes.
Falun . . .	*Sweden*	23·31	39·18	59·29	42·14	40·98	43·14	35·98	5	. .
Uist . .	*Shetland Isles*	38·68	43·07	52·68	44·35	44·70	17·50	14·00	1	7½, 8½.
Yakoutsk . .	*Siberia*	—36·37	15·61	61·72	12·76	13·43	114·26	98·09	2	5 times.
Hernösand .	*Sweden*	17·35	33·04	56·07	38·41	36·22	42·35	38·72	28	. .
Jamtland . .	*Sweden*	12·26	30·26	55·34	34·94	33·20	47·88	43·08	4½	Morning, noon.
Woro . . .	*Finland*	17·57	35·59	60·59	39·19	38·23	48·85	43·02	25	7, 12, 9.
Drontheim .	*Norway*	23·39	35·29	61·39	40·23	40·08	45·38	38·00	. .	7, 2, 9.
Umea . . .	*Sweden*	13·47	33·16	57·42	37·45	35·37	49·84	43·95	8½	. .
Reikiavig . .	*Iceland*	29·18	37·04	53·54	37·94	39·43	27·88	24·36	14½	Daily extremes.
Godhaab .	*Greenland*	14·14	23·26	40·62	29·14	26·79	29·54	26·48	13½	10, 10.
Archangel .	*Russia*	9·43	31·66	57·85	35·15	33·53	54·78	48·42	18	7, 2, 9.
Ulcaborg . .	*Finland*	8·42	24·86	55·40	31·10	29·95	54·00	46·98	12	6, 6.
Fort Franklin	*N. Amer.*	—16·66	14·05	50·23	21·12	17·18	74·44	66·89	1¾	19 times.
Winter Island	*Hudson's B.*	—20·47	6·35	31·80	17·58	8·82	60·85	52·27	1	2 hourly.
Eyafiord . .	*Iceland*	20·84	28·10	45·80	34·46	32·30	28·62	24·96	2	. .
Enontekeis .	*Lapland*	0·34	24·86	55·03	27·13	26·84	60·10	54·64	4	. .
Igloolik .	*Polar Regions*	—31·32	1·76	35·04	6·72	5·55	67·34	56·36	1	2 hourly.
Kafiord . .	*Norway*	19·40	33·27	53·46	34·06	35·05	43·15	34·06	2	Daily extremes.
BoothiaFelix .	*Pr. Regions*	—21·71	—5·21	38·04	9·69	3·70	73·28	65·75	2½	Hourly.
Kara . .	*NovaZembla*	3·21	3·32	35·59	17·85	14·99	48·19	32·38	1	2 hourly.
Seichte Bay	*Nova Zembla*	9·78	15·12	36·60	21·48	20·74	28·40	26·82	1	2 hourly.
Ustjansk . .	*Siberia*	—35·90	10·22	50·26	8·52	4·01	98·08	86·16	2	8, 12, 4, 12.
MokoschinnSchar	*Nova Z.*	—2·29	10·82	38·49	20·69	16·93	48·67	40·78	1	2 hourly.
Port Bowen	*Pr. Regions*	—25·09	—5·77	34·40	10·58	3·53	65·46	59·49	1	2 hourly.
Melville Is.	*Pr. Regions*	—28·45	—3·19	37·08	—0·48	1·24	74·90	65·53	1	2 hourly.
Spitzbergen .	—	. .	. .	34·52	. .	. .	. .	. .	⅓	2 hourly.

The exact relation which the mean, deduced from observations made at various hours, bears to the mean temperature of the twenty-four hours, is a desideratum for estimating comparatively the respective temperatures of any two places mentioned in the preceding table. Those marked *Reduced* and *N. Y.* have been corrected to the true mean; and from this the mean deduced from the *Daily Extremes* differs very little. Besides these, the means of observations taken at certain hours mentioned below are also found to vary little from the true mean. An approximation to within a degree of this will be sufficiently near for purposes relating to cultivation.

The means of observations taken at—

6 A.M.	and	6 P.M.	average	about	$\frac{3}{4}$	of a degree	below	the mean.
7	,,	7	,,	,,	$\frac{9}{10}$	,,	,,	
8	,,	8	,,	,,	$\frac{3}{4}$	,,	,,	
9	,,	9	,,	,,	$\frac{4}{10}$	,,	,,	
10	,,	10	,,	,,	equal to the mean.			

7 A.M., 2 P.M., and 9 P.M. are hours which have been adopted at a great number of places; and these three daily observations afford a mean averaging scarcely $\frac{1}{2}$ a degree above the mean of the twenty-four hours.

I may here remark, that with reference to cultivation, the observations from thermometers indicating the maximum and minimum daily temperatures are the most valuable. Although hours may be selected which will give, as in the above cases, the mean temperature, sufficiently near for all practical purposes, yet from registering maximum and minimum thermometers much more is obtained—the extremes are known, and from these the mean maximum, mean minimum, and consequently the average range of temperature, can be deduced. It is important for gardeners to know all these particulars; and hence desirable that such instruments should be employed as will render it possible for them to do so.

REPORT FROM THE COUNCIL

TO THE

ANNIVERSARY MEETING, MAY 1, 1849.

The last Anniversary Meeting having authorized the Council to prepare for the approval of the Society a set of amended By-laws, various points have been taken into consideration during the autumn, and a careful examination has been instituted of the rules found to work advantageously in other public bodies of a similar nature to the Horticultural Society. On the 24th of October the Council finally approved of the alterations which had been made. On the 7th of November and 5th of December, 1848, the amended By-laws were laid before the Society and read a first and second time; and at a Special General Meeting summoned for the purpose, on the 16th of January, 1849, all the formalities prescribed by the Charter having been observed, the old By-laws were repealed and the new By-laws were passed unanimously.

The Council trust that the changes introduced will be found advantageous. They have been made with a view to obviate some practical difficulties which existed in working the former By-laws, to simplify the proceedings of the Society, and to promote its prosperity, by rendering them more acceptable to the Fellows. Among the powers granted to the Council is that of creating a class of Associates with fewer privileges than Fellows, and paying consequently a smaller subscription. The expediency of establishing such a class will receive the most anxious consideration of the Council, and they are desirous of receiving any suggestions which those who advocate the plan may be willing to favour them with.

Exhibitions.

It is needless to remind the Society how unfavourable the summer of 1848 proved to Meetings in the open air. The subjects of exhibition were, with the exception of fruit, if possible

finer than any that had before been witnessed, proving that, up to the present time, English Horticulture continues to make steady progress. The Council have peculiar satisfaction in making this statement, because they feel that the pre-eminence of Modern English Gardening is, in a great degree, attributable to the encouragement it receives from the Fellows of the Society, not only in their corporate capacity, but as private individuals.

The number of visitors experienced a material diminution, in consequence of the unfavourable weather, which was cold and unsettled in May, with a falling barometer, and in June became so decidedly bad, that the whole number of visitors on the 10th of that month was but 870. And although the Exhibition in July, when His Grace the President again added the attractions of Chiswick Gardens to those of the Society, was visited by the unprecedented number of 14,084 persons, even so large a concourse was insufficient to counterbalance the deficiency of May and June. In the whole 18,114 tickets were issued, which was 5803 fewer than in 1846, and 2959 fewer than in 1847. In this season only 259 more tickets were issued than were used.

It being some years since any return of the comparative numbers of visitors on the three days of exhibition was published, the following statement on the subject is given, complete to 1848:—

Date.	Morning.	Noon.	Max. Temp. in shade.	Wind.	Visitors.
1833.			°		
SAT. May 25	Very fine. .	Very fine. .	82	Little, S.W.	1,700
" June 22	Fine . . .	Cloudy . .	72	Brisk, S.W.	2,000
" July 20	Fine . . .	Cloudy . .	70	Little, W.	1,200
					4,900
1834.					
SAT. May 10	Fine . . .	Fine . . .	73	Little, S.W.	1,402
" June 7	Very fine. .	Very fine. .	78	Little, S.E.	2,870
" July 5	Overcast . .	Very fine. .	81	Little, N.E.	3,076
" Sept. 13	Fine . . .	Very fine. .	68	Little, E. .	897
					8,245
1835.					
SAT. May 9	Fine . . .	Fine . . .	71	Brisk, S.W.	1,908
" June 6	Fine . . .	Fine . . .	81	Brisk, N.E.	5,362
" July 4	Very fine. .	Very fine. .	78	Little, W. .	5,612
					12,882

Date.	Morning.	Noon.	Max. Temp. in shade.	Wind.	Visitors.
1836.			°		
SAT. May 14	Very fine. .	Very fine. .	72	Little, N.W.	3,480
,, June 11	*Slight rain* .	Fine . . .	73	Brisk, S. .	7,764
,, July 9	Overcast . .	Very fine. .	79	Brisk, W. .	6,088
					17,332
1837.					
SAT. May 13	Fine . . .	Cloudy . .	58	Little, S. .	750
,, June 10	Cloudy . .	Cloudy and fine.	68	Strong, S. .	8,785
TUES. July 11	Very fine. .	Very fine. .	76	Brisk, E. .	6,463
					15,998
1838.					
SAT. May 26	Overcast . .	Fine . . .	64	Brisk, N.E.	2,966
,, June 16	*Drizzly* . .	Overcast, fine	76	Little, S. .	6,405
WED. July 11	Very fine. .	Very fine. .	80	Little, S.W.	6,546
					15,917
1839.					
SAT. May 18	Very fine. .	Fine . . .	64	Brisk, S.W.	3,044
,, June 15	Slight haze .	Slight haze .	63	Little, N.E.	8,789
,, July 6	Slight haze .	Sultry . .	76	Little, S.W.	5,781
					17,614
1840.					
SAT. May 16	Cloudy . .	*Hail, showery*	65	Brisk, S.W.	2,471
,, June 13	Cloudy and fine.	Cloudy and very fine.	77	Little, W. .	11,594
,, July 4	Very fine. .	Fine . . .	72	Brisk, W. .	5,072
					19,137
1841.					
SAT. May 15	Fine . . .	Very fine. .	74	Little, W. .	5,600
,, June 12	Overcast,—*slight rain.*	Overcast, and fine.	53	Little, N.E.	8,975
,, July 10	Very fine. .	Very fine. .	71	Little, S.W.	7,194
					21,769
1842.					
SAT. May 14	Slight haze .	Exceedingly fine.	72	Little, W. .	5,369
,, June 11	Very fine. .	Sultry, hot, and dry.	89	Little, N.E.	13,351
,, July 9	Overcast . .	Cloudy and fine, *slight rain* in afternoon.	72	Brisk, W. .	3,445
					22,165

Date.	Morning.	Noon.	Max. Temp. in shade.	Wind.	Visitors.
1843.			°		
SAT. May 13	Overcast, with cold haze.	Fine, with light clouds.	66	Little, W. .	4,654
,, June 17	Clear early; overcast.	Very fine, with light clouds.	75	Brisk, N.E.	10,862
WED. July 12	Hazy . . .	Lightly overcast, but very fine.	77	Little, N.W.	7,373
					22,889
1844.					
SAT. May 18	Slight frost, with cold N.E. wind.	Boisterous, with *slight showers*.	54	Strong, N.E.	4,203
,, June 15	Very fine. .	Very fine. .	78	Brisk, W. .	13,334
,, July 13	Very fine. .	*Rain* . . .	71	Brisk, S.W.	4,052
WED. July 31	Cloudy, with brisk wind.	Cloudy and fine.	72	Brisk, W. .	2,267
					23,856
1845.					
SAT. May 24	Hazy clouds .	Cloudy . .	61	Little, W. .	3,481
,, June 21	Very fine, with light clouds.	Exceedingly fine.	80	Little, E. .	12,310
,, July 12	Fine . . .	Fine, partially clouded.	64	Brisk, N.W.	5,966
					21,757
1846.					
SAT. May 9	Fine . . .	Very fine. .	72	Brisk, S.W.	4,858
,, June 13	Fine . . .	Hot and dry .	86	Brisk, N.E.	13,421
,, July 11	Partially overcast.	Very fine, with light clouds.	73	Little, W. .	6,083
					24.362
1847.					
SAT. May 8	*Rain* . . .	*Showery* . .	60	Brisk, S. .	1,644
,, June 19	Light clouds.	Cloudy and fine.	72	Little, N.W.	10,940
,, July 17	Thunder, lightning, and *heavy rain*.	Fine . . .	72	Little, E. .	6,827
					19,411
1848.					
SAT. May 20	*Showery* . .	Cloudy . .	69	Brisk, N.W.	3,238
,, June 10	*Rain* . . .	*Heavy rain* .	63	Little, S.W.	870
WED. July 12	Very fine. .	Very fine. .	81	Little, E. .	14,084
					18,192

*** The numbers given are in all cases exclusive of supernumeraries.

As it has been found that, notwithstanding the higher encouragement given by the Society to the exhibitions of fruit, the specimens produced are by no means equal in merit to those of flowers, it has appeared to the Council no longer advisable to offer large prizes for fruit in May and June; and it has, therefore, been determined, without excluding fruit in these months, to confine the competition to July, when the season offers greater facilities for exhibition. On that occasion, moreover, the usual prizes are augmented by three, of the respective values of 15*l.*, 10*l.*, and 5*l.*, to be given to the three best collections of fruit. It is to be hoped that the result of this measure will be to render the fruit more worthy of the high character which belongs to English gardening. At the same time some other alterations have been made in the prizes offered for flowering plants, with a view to secure a better distribution of them. These changes will, it is expected, produce some diminution of the heavy expenses attending the exhibitions; but, on the other hand, the account for 1849 will be chargeable with above 300*l.* for the purchase of new tents, to replace old ones which have been ruined by bad weather, or otherwise worn out.

The actual cost incurred by the Society in this part of its expenditure was 2579*l.* 4*s.* 1*d.*, as detailed in the following comparative account:—

EXPENSES OF THE EXHIBITIONS.

	1846.			1847.			1848.		
	£.	s.	d.	£.	s.	d.	£.	s.	d.
Materials for orchestra, tables, &c.	45	5	5	..			12	1	0
Miscellaneous timber	..			41	18	10	17	0	10
Repairs of tents	8	18	6	12	9	2	17	18	3
Repairs of ladies' cloak-room and other rooms	7	3	2	..			1	17	1
Oil, paint, &c.	18	8	1	13	12	7	9	13	9
Miscellaneous ironwork	24	15	11	19	8	9	12	4	8
Turf, gravel, &c., and road repairs	85	14	0	39	2	0	3	19	6
Handbarrows, water-pots, &c.	5	13	6	25	6	6	17	9	4
Carpenters, painters, tent-pitchers, &c.	152	16	5	162	10	8	138	14	1
Miscellaneous labour beyond what is required for the ordinary service of the Garden	308	3	3	295	13	4	251	2	10
Hire of crockery	12	13	0	12	13	0	12	5	0
Miscellaneous printing	85	0	6	70	18	0	90	15	0
Admission tickets	44	0	0	49	1	0	43	10	0
Advertisements	97	19	6	93	4	6	76	2	6
Cloak-room expenses	6	1	0	5	8	6	5	8	9
Judges	56	8	0	47	5	0	39	18	0
Extra clerks and hire of temporary rooms	39	5	6	54	1	0	56	9	0
Police	123	2	0	115	18	0	115	11	0
Hats given to the men belonging to the Garden	..			4	12	0	4	9	0
Bands and all musical expenses	349	15	0	314	4	0	306	17	0
Provisions for exhibitors, police, &c.	63	4	9	53	11	3	56	17	3
Watering roads	30	5	6	12	0	0	28	5	0
Miscellaneous expenses, including stationery, carriage, postage, messengers, &c.	46	18	5	78	1	3	56	0	3
Hire of tent, &c., for His Highness Ibrahim Pacha and suite	10	10	0	..			..		
Refreshments for ditto	33	4	3	..			..		
	1655	5	8	1520	19	4	1374	9	1
Medals awarded	1284	0	0	1262	0	0	1204	15	0
	2939	5	8	2782	19	4	2579	4	1

Concerning the Ordinary General Meetings in Regent-street, the Council have to report that, in consequence of the small number of objects of exhibition now produced on these occasions during the months of May, June, and July, they have directed them to be discontinued in the usual form during those months, the meetings in the Society's Garden and elsewhere having rendered separate exhibitions at that season superfluous. The Council, however, have the satisfaction to state that Dr. Lindley

has consented to give Six Lectures on Horticulture to the Fellows of the Society on the following Tuesdays:—viz., May 15 and 22; June 12 and 26; and July 3 and 17; and in order to enable those who may wish it, to exhibit on those days flowers or fruit which cannot be received at the Garden Meetings, the Council have availed themselves of the power given them by the by-laws to constitute such Lectures Ordinary General Meetings.

Finance Committee.

The Finance Committee, referring to their last Annual Report, have since ascertained that to many of the arrears remaining on the books the Society has no legal claim, and that in some other cases it is not expedient to incur the cost of enforcing claims which might probably have been collected in former years. It has been found necessary to remove from the books of account old subscriptions amounting to 319*l.* 18*s.* 6*d.*; to suspend subscriptions due to the amount of 265*l.* 4*s.*; and others will doubtless be found beyond the reach of recovery. These, however, are not regarded as available assets in the statement of the property of the Society given in another part of this Report. The arrears actually received during the year amount to 213*l.* 1*s.*

The enactment of the new by-laws will, it is expected, facilitate the operations of the Committee, and enable them by degrees to extinguish the old arrears, and to make such arrangements as will lessen the probability of a fresh accumulation, by a more regular and punctual collection of subscriptions, in the accomplishment of which object they solicit the kind co-operation of all the members.

The Committee have to report that the amount of arrears of subscriptions, of all sorts, due on the 1st of May, 1848, is now 618*l.* 10*s.*, a much smaller sum than has appeared under this head for many previous years.

A comparison of the income of the Society for the last two years gives the following results:—

								1847–8.			1848–9.		
								£.	s.	d.	£.	s.	d.
Admission Fees								258	6	0	214	4	0
Compositions for life								210	0	0	294	0	0
Annual subscriptions								3237	1	6	3023	10	0
Transactions, &c. sold								28	6	2	48	17	3
Rent of apartments let off								150	0	0	150	0	0
Quarterly Journal sold								75	17	6	64	15	0
Garden produce								29	2	10	24	8	5
Receipts for garden charges								49	12	9	47	4	6
Miscellaneous receipts								23	3	5	4	5	7
Profit on Exchequer Bills.								42	13	6	9	3	4
Garden Exhibitions.													
	1847.				1848.								
Receipts.	£4484	1	6	—	3867	14	0						
Expenses	2750	18	1	—	2544	18	10						
	1733	3	5	—	1322	15	2	1733	3	5	1322	15	2
Garden Exhibitions of Current Year.													
	1847–8.				1848–9.								
Receipts.	£150	6	6	—	302	12	0						
Expenses	34	5	3	—	40	9	6						
	116	1	3	—	262	2	6	116	1	3	262	2	6
							£	5953	8	4	5465	5	9

This presents a diminution amounting to 488*l.* 2*s.* 7*d.*, which is more than accounted for by the decrease of 430*l.* 8*s.* 3*d.* in the profit derived from the exhibitions, and by a deficiency under the head of annual subscriptions to the amount of 213*l.* 11*s.* 6*d.*, principally ascribable to the amount of accumulated arrears previously collected by the operations of the Finance Committee of 1847–8, and formerly reported upon.

The Council, in conducting the business of the Society, have continued to observe all practicable economy, consistent with its permanent interests. A comparison of the expenses of 1847–8 with those of 1848–9 is exhibited in the following statement:—

	1847–8.			1848–9.		
	£.	s.	d.	£.	s.	d.
Rents, rates, taxes, &c.	682	15	0	663	6	1
Repairs, &c., Regent Street . . .	43	2	6	32	11	11
Housekeeping expenses	40	14	8	36	0	6
Salaries, poundage, &c.	1135	9	0	1102	16	2
Interest, &c.	295	2	8	334	7	10
Cost of Transactions, &c.	166	16	3	49	15	1
Cost of Quarterly Journal	504	11	7	375	19	8
Library charges	24	3	9	13	8	10
Printing and stationery	66	11	8	93	7	5
Medals at meetings in Regent Street . .	81	10	0	82	0	0
Foreign missions and imports . . .	149	2	3	73	11	7
Expenses of meetings, &c.	137	6	6	156	13	3
Miscellaneous expenses at Regent Street .	20	3	4	..		
Ditto at Garden	251	7	5	258	7	11
Implements, mats, &c.	78	16	10	118	17	9
Tan, dung, &c.	45	9	3	42	5	6
Distribution expenses	233	6	10	242	0	0
Garden labour	1015	11	3	1024	6	10
Coals and coke for Garden	209	18	0	89	10	0
Garden repairs	107	13	10	298	6	11
Extra debt on medals	..			18	11	9
£	5289	12	7	5106	5	0

This comparison shows a total diminution of expense to the extent of 183*l.* 7*s.* 7*d.*, notwithstanding that the account includes one week's labour at the Garden more than in the last year, and that it has been necessary to incur the cost of 126*l.* 15*s.* 2*d.* in replacing the boilers of the great conservatory, the necessity of which was announced in the Report made to the last Annual Meeting. The Council would also observe that the reduction in the expense of the establishment in Regent-street has not amounted to so much as was anticipated, in consequence of the long employment of the Accountant in remodelling and renewing the books of the Society; and that a debt of 18*l.* 11*s.* 9*d.* for Medals, not discovered at the period of the last general Audit, and now discharged, is placed among the annual expenditure. Some unusual expenses have also been incurred in Regent-street in consequence of passing the new By-laws, and specially summoning by post extra Meetings on that account, and in the purchase of a caravan (38*l.*) for the purpose of conveying plants from the Garden to the Meetings.

The experience of a second year has justified the expectations entertained by the Council of the advantages attendant upon the employment of a professional accountant, and they desire to express their entire satisfaction at the manner in which the duty

of that important officer has been performed by Mr. Duncan. Under his advice the manner of keeping the accounts has been improved and simplified, and the quarterly balance-sheets have been ready for the Auditors' examination immediately after the quarter has closed.

The following Report from the Auditors, dated April 12, 1849, together with the audited accounts of previous years, furnishes the data upon which the preceding statements are grounded.

In some of the details these accounts are not, however, literally in accordance with the previous statements, in consequence of alterations in the manner of arranging the accounts, an inconvenience that will not recur.

State of the Debt of the Society on the 31*st March*, 1849.

				£.	s.	d.	£.	s.	d.
Amount of Debt, 1 April, 1848 . .				. .			8610	12	6
Amount of Debt, 1 *April*, 1849, *viz.*,—									
To Creditors on Loan Notes . .				5400	0	0			
To Sir Wm. P. Call and Co. on Loan				1500	0	0			
To Liabilities (*see opposite page*) .				2134	16	8			
				9034	16	8			
Less Cash Balance .	£447	4	11						
£400 6*s*. 7*d*., 3 per Cent. Consols at cost . .	336	0	0						
				783	4	11			
							8251	11	9
Reduction in Debt since 1 April, 1848 . . . £							359	0	9

A. DUNCAN, Accountant.

AUDITED ACCOUNT OF THE HORTICULTURAL SOCIETY OF LONDON.

RECEIPTS, PAYMENTS, and LIABILITIES from the 1st of April, 1848, to the 31st of March, 1849.

RECEIPTS.

		£. s. d.
To compositions for life from Fellows, 7 at 40 Guineas each		294 0 0
To annual subscriptions		3023 10 0
To admission fees from Fellows, 34 at 6 Guineas each		214 4 0
To Transactions and Fruit Catalogue sold		48 17 3
To Quarterly Journal sold		64 15 0
To rent of apartments let off in Regent Street		150 0 0
To garden produce sold		24 8 5
To receipts from members for garden charges		47 4 6
To miscellaneous receipts		4 5 7
To Garden Exhibitions, 1848		3867 14 0
ditto ditto 1849		302 12 0
To profit on purchase and sale of Exchequer Bills		9 3 4
		8050 14 1
To Sir W. P. Call and Co. on loan		1500 0 0
To Balance at Banker's, 1 April, 1848	£570 12 7	
ditto with Vice-Secretary ditto	16 2 8	
		586 15 3
	£	10,137 9 4

12 *April*, 1849.

This account has been examined, and, being compared with the Vouchers, found correct.

THOS. HOBLYN,
GEO. BAIN,
SAMUEL F. GRAY, } Auditors.

PAYMENTS AND LIABILITIES.

		Payments. £. s. d.	Liabilities. £. s. d.
By interest on loan notes, &c.		334 7 10	
By rents, rates, taxes, &c. Regent Street and Chiswick		174 8 10	488 17 3
By repairs, furniture, &c., Regent Street		24 12 2	7 19 9
By housekeeping expenses ditto		36 0 6	
By salaries, collector's poundage, &c.		855 0 4	247 15 10
By cost of Quarterly Journal		221 1 11	154 17 9
By cost of Transactions and Fruit Catalogues		49 15 1	
By library charges		8 4 10	5 4 0
By printing, stationery, &c.		81 7 11	11 19 6
By foreign missions and imports		73 11 7	
By expenses of meetings, postage, carriage, &c.		156 13 3	
By garden labour		1024 6 10	
By implements, mats, seeds, &c.		66 0 3	52 17 6
By tan, dung, &c.		38 9 6	3 16 0
By coals and coke for garden		. .	89 10 0
By miscellaneous expenses at garden		222 3 10	36 4 1
By garden repairs		232 11 4	65 15 7
By distribution expenses		144 1 6	97 18 6
By Exhibition expenses, 1848		1291 7 11	48 15 11
ditto ditto 1849		40 9 6	
		5074 14 11	
By outstanding accounts, 1 April, 1848	£1324 16 6	1191 16 6	133 0 0
			1444 11 8
By medals' account :—			
Balance outstanding, 1 April, 1848	£482 11 3		
Awarded since	1305 6 9		
	£1787 18 0	1097 13 0	690 5 0
			2134 16 8
By creditors on loan notes paid off		2200 0 0	
By cost of 151*l.* 16*s.* 2*d.* 3 per Cent. Consols		126 0 0	
By Balance at Banker's	£440 9 5		
ditto with Vice-Secretary	6 15 6		
		447 4 11	
	£	10,137 9 4	

A. DUNCAN, Accountant,
10, Tokenhouse Yard.

The most important financial operation of the year has been the re-arrangement of that portion of the debt of the Society which bears interest.

In October last the loan notes bearing 4 per cent. interest, and amounting to 7600*l.*, became payable. Holders to the amount of 2200*l.* having signified their desire to receive their principal, were paid off, with the aid of a loan of 1500*l.* from the Society's bankers, of which sum 1000*l.* have been repaid since the Auditors' report was closed. The remaining loan notes, to the extent of 5400*l.*, have been renewed at 5 per cent. with the consent of the holders.

The total debt at the close of the year was 8251*l.* 11*s.* 9*d.*, against which there is the whole property possessed by the Corporation. The actual value of that property cannot be accurately ascertained without incurring an expense for which the Council perceive no necessity. The Auditors of last year made some observations as to this point; but since the value of a part of the Society's property in 1848 was by them assumed to be the same as it had been found in 1831, the Treasurer has now prepared the following amended statement, which, in the absence of a professional valuation, may be assumed to express the true value of the Society's fixed and floating property, and is believed to be rather under than exceeding its actual value:—

	£.	s.	d.
Lease of the house in Regent Street . . .	4,000	0	0
Library, &c. there	1,000	0	0
Furniture there	200	0	0
Effects at the Garden and lease of the Garden .	12,000	0	0
Estimated value of stock of Transactions, Journals, Fruit Catalogues, copper-plates, wood-blocks, &c.	948	0	0
Amount of unpaid subscriptions due May 1, 1848, supposed to be good	618	10	0
Amount of unpaid subscriptions for the past year now due	2,818	4	0
Miscellaneous assets, consisting of rent due, unpaid dividends, and sums due for Transactions sold	95	5	6
	£ 21,679	19	6

The debts then, amounting to 8251*l.* 11*s.* 9*d.*, and the property bearing the value of 21,679*l.* 19*s.* 6*d.*; the balance in favour of the Society is at least 13,428*l.* 7*s.* 9*d.*

The Garden.

Since the last anniversary Mr. Hartweg, the collector dispatched to California, has returned, and his engagement has been brought to a close. Although the Council had not reason to be satisfied

with the manner in which Mr. Hartweg executed the duty intrusted to him, either in keeping the journal of his proceedings or in forming collections of seeds, they are nevertheless able to state that some species of considerable interest, in addition to those already mentioned, have been raised in the Garden, and distributed to the Fellows, as far as the very small quantity of seeds sent home has permitted.

Of these species the following are the principal :—

Ceanothus dentatus. A shrub 3 feet high. In open places near Monterey.
Ceanothus rigidus. An evergreen shrub 4-5 feet high. In open places near Monterey.
Ceanothus papillosus. A shrub 10 feet high. Mountains of Santa Cruz.
Ceanothus cuneatus. A shrub 6-8 feet high. Sacramento Mountains.
Ceanothus integerrimus? An evergreen shrub 10 feet high. Santa Cruz Mountains.
Abronia sp., with purple flowers. A perennial. In the sands near the sea-shore, San Luis Obispo.
Cercocarpus sp. An evergreen shrub 10 feet high. Carmel Mountains. Very curious.
Monardella undulata. An annual. In fields near Monterey.
Lupinus affinis. An annual. In woods near Monterey.
Pentstemon cordifolium. A shrub 4 feet high. Mountains of Santa Ines.
Pentstemon heterophyllum. From the Sacramento Valley.
Pentstemon azureum. On a dry ferrugineous clay. Mountains of Santa Ines.
Cerasus ilicifolia, called "Islay." An evergreen shrub or small tree. Mountains of San Antonio and San Luis Obispo.
Ribes ferox. A shrub 4-5 feet high. On sand-hills near San Francisco; in damp and shady places near San Luis Obispo.
Limnanthes rosea. In swampy places of the Sacramento Valley.
Limnanthes alba. From the plains of the Sacramento Valley; in moist places.
Castanea chrysophylla. The evergreen chesnut.
Nemophila maculata. From the Sacramento Mountains.
Collinsia tinctoria. An annual from the Sacramento Mountains.
Diervilla sp. A half-climbing shrub 6-12 feet high. In woods near Carmel Bay, Monterey.
Pinus tuberculata. A tree 15-20 feet high. Mountains of Santa Cruz.
Pinus radiata. From near the sea-shore, near San Luis Obispo.
Pinus muricata. Woods near Monterey.
Pinus Fremontiana, or Nut Pine.
Cupressus Goveniana. A shrub 6-10 feet high. On decomposed granite in the woods near Monterey.
Adenostoma fasciculata. A shrub 3 feet high. In open places near Monterey.
Echeveria pulverulenta. From the mountains of Santa Ines.
Rhamnus sp. A dwarf evergreen shrub. Found near the sea-shore, Monterey.
Laurus regalis. A large tree. Mountains of Santa Cruz and Sonoma.
Rhamnus oleæfolius. A shrub 6-8 feet high. Woods near Monterey.
Nuttallia cerasiformis. A shrub 2 feet high. Woods near Monterey.

Cyclobothra monophylla. A bulb from the Sacramento Mountains.
Brodiæa californica. Plains of the Sacramento Valley.
Jatropha podagrica, called "Ruibarbo," from Nicaragua. "The thick part of the stem is used by the inhabitants of Nicaragua instead of Rhubarb."
Leptosiphon aureus. An annual. From the Sacramento Valley.
Mimulus tricolor. From the plains of the Sacramento Valley.

The Council do not think it prudent to incur the expense of another collector for the present.

A pair of new boilers has been applied to the iron conservatory —a work the necessity for which was pointed out at the last anniversary. These boilers, supplied by Messrs. Burbidge and Healy, of Fleet-street, have proved very effectual, and have been made of such a size that the conservatory may be filled with plants more tender than those now grown in it, should it hereafter appear advisable to maintain a higher temperature. In setting these boilers the Garden Committee have directed that the masonry should be such as would secure the greatest amount of heat with the smallest expenditure of fuel; and it is satisfactory to report that this object has been completely effected. It has also been found possible to maintain the fire in a state of combustion for more than forty-eight hours without any renewal of the fuel.

To the Correspondents of the Society the Garden continues to be indebted for numerous useful communications, among which the following may be more particularly named:—

From G. U. Skinner, Esq., 25 varieties of Achimenes, various Guatemala Orchids, and other plants.
From Dr. Gardner, of Ceylon, Dwarf Jaffna Cocoa-nuts.
From Col. Sykes, Arduina grandiflora, or the Natal Plum.
From the Glasnevin Botanic Garden, Gynerium argenteum, a beautiful hardy grass.
From J. B. Pentland, Esq., Cinchona Calysaya, and tubers of Melloca tuberosa.
From John Williams, Esq., of Pitmaston, Seedling Black Cluster-Grape, cuttings of Late Gansel's Bergamot, and Pitmaston Prolific Currant.
From the Honourable Court of Directors of the East India Company, East Indian Orchids and Seeds.
From Mr. Prince, of New York, a collection of Hardy American Terrestrial Orchids.
From M. Linden, of Luxembourg, a quantity of Orchids and Stove Plants.
From Mr. Zeyher, of the Cape of Good Hope, a collection of Cape Orchids and other Bulbs; with seeds of 10 kinds of Cape Pelargoniums.
From Dr. Fischer, of St. Petersburgh, Panax horrida, 2 kinds of Ribes, and various other plants.
From M. de Jonghe, of Brussels, Zygopetalum brachypetalum, and various other plants, together with a red variety of potato called the "Bienfaiteur," and tubers of Melloca tuberosa.

From Messrs. Vilmorin, of Paris, Melloca tuberosa and Psoralea esculenta, two new esculent roots.
From M. Jamin, of Paris, Cuttings of 11 new French Pears, and a plant of Pêche Reine des Vergers, "said to be one of the best that has been obtained for many years."
From Mr. Glendinning, 83 young Fruit Trees, consisting of Apples, Pears, and Plums, and a considerable quantity of Stove and Greenhouse Plants.
From Messrs. Wood and Son, of Maresfield, various sorts of Apples and Pears.
A considerable number of useful plants from Messrs. Veitch and Son, Messrs. Knight and Perry, Mr. A. Henderson, Mr. Hugh Low, Messrs. Rollisson, Messrs. Lucombe and Pince, Mr. Groom, &c.

The Reading-Room shows, by the diligent attendance of the men, that its value is appreciated by them. Some of the men are found to spend there as many as 27 evenings in a month, and 22, 23, 24, 25, and 26 evenings are not uncommon attendances on the part of others.

At the annual examination, previous to which the men are not recommended to places, two young men, namely, Samuel Colmer and William Culverwell, passed with credit in the order in which they are named.

Prizes have been given to the young men by the Vice-Secretary:—1. For the best examinations in making Ground-Plans; 2. the Measurement of Land; 3. Arithmetic; 4. Euclid; 5. Vegetable Physiology; and 6. the Practice of Gardening.

A guinea each has also been contributed by Mr. Horsman Solly and Mr. Glendinning in aid of prizes for the Design of a Flower Garden; and 16*s*. have been received from Mr. Wood, of The Coppice, Nottingham, to be applied to the purposes of the Reading-Room.

Six lessons in the art of making Plans of Gardens and other ground-plans have been again given by Mr. Rauch: and Dr. Lindley has delivered lectures on Night Temperature; the Nature and Physiology of Leaves, and the modes of applying differences of structure and form scientifically to the practical distinction of plants; the connection between Vegetation and Carbonic Acid; the Philosophy of Draining; Light, in its relation to plants; Hybridizing; Soils and Manures.

The following presents have been received for the use of the Reading-Room since the last anniversary:—

From the VICE-SECRETARY:—
Sowerby's English Botany, vol. i. Second edition. 8vo.
Moore's Hand-Book of British Ferns. 12mo. 1848.
Sidney's Australian Hand-Book. 1848. A Pamphlet.
The Horticultural Almanac and Gardeners' Year-Book for 1849.
The Emigrant's Guide to New Zealand. 1848. A Pamphlet.
Dr. Whateley on Instinct. 1847. A Pamphlet.

Our Fellow-Lodgers. By the Rev. Dr. Walsh. 1847. A Pamphlet.
Zoology and Civilization. By Dr. Butt. 1847. A Pamphlet.
The Intellectuality of Domestic Animals. By the late Rev. Cæsar Otway. 1847. A Pamphlet.
Glenny's Garden Almanac and Florists' Directory for 1849. 12mo.
Peter Lawson and Son on Cultivated Grasses. A Pamphlet. Second edition. 1845.
Flora Hertfordiensis. By the Rev. R. H. Webb, assisted by the Rev. W. H. Coleman. 12mo. 1848.

From Mr. William Culverwell:—
A Small Case of specimens of Insects injurious to Gardeners.

From A. J. Downing, Esq., of Newburgh, New York:—
The Horticulturist, and Journal of Rural Art and Rural Taste, &c. Vol. I., July, 1846, to June, 1847; and Vol. II., July, 1847, to June, 1848. 8vo.

The number of Visitors to the Garden, exclusive of the days of Exhibition, has been 6,924, or nearly 600 more than in 1847.

The distribution of plants, packets of seeds, and parcels of cuttings from the Garden has been as follows:—

1848–49.	Plants.	Seeds.	Cuttings.
To Members	6,762	45,740	2,743
To Foreign Countries, Correspondents, &c.	636	487	63
To Her Majesty's Colonies	12	713	24
Total	7,410	46,940	2,830

Although the resources of the Society may be regarded as having suffered less than might have been expected from the commercial difficulties in which so many have been entangled, yet the Council do not propose to incur any material expenses which are not absolutely required for the maintenance of the Society in a healthy state, until the prosperity of the country shall have been further restored. They will, however, be anxious, at the earliest possible opportunity, to erect a sufficient reading-room, and to provide better accommodation for the valuable tender plants with which the hot-houses are crowded.

ORIGINAL COMMUNICATIONS.

XVII.—*Description of the Kaisha, a new Syrian Apricot, introduced by John Barker, Esq., of Suedia.* By Robert Thompson, Superintendent of the Orchard and Kitchen Garden Department in the Society's Garden.

(Communicated August, 1848.)

Fruit of this was sent to the Society, July 21, 1848, by J. Warmington, Esq., of Kensington, accompanied by the following note:—"I take leave to send you a couple of Apricots from one of Mr. Barker's Syrian trees, which has borne for the first time this year, and carried twelve fruits to maturity—rather too many for its size. I know not if it possesses any advantages over the common sort, but it certainly is early. Some of the fruits were ripe on the day of the late Chiswick Exhibition, 12th of July; and on the same wall where these ripened were Moorpark and Turkey apricots perfectly green and hard." The tree was sent to Mr. Warmington by John Barker, Esq., from his garden at Betias, near Suedia, in the Pachalik of Aleppo, where he states there exist thirteen varieties of Apricots with *sweet kernels*—this is one of them; and the sweet-kernelled apricot of Ispahan, or "*Shuker Para*," described in vol. iii. p. 228, is another. The fruit is roundish, five inches and a half in circumference, rather deeply and acutely channeled on one side near the base, the channel becoming less, till only like a shallow indented line as it approaches the summit, where it terminates in a slight depression formed round the base of the style. The fruit is semitransparent. Skin slightly downy, pale citron-coloured where shaded, tinged and marbled with red next the sun. Flesh tender, juicy, of a clear citron-colour, parting freely from the stone, sugary and delicious—like well-refined lump-sugar combined with the Apricot flavour. Stone small, roundish; kernel *sweet*, like a nut.

A valuable early variety for the dessert; and probably excellent for preserving; if it be employed for this purpose, the transparency of its flesh will exhibit a new feature amongst apricot preserves. By its clear citron-coloured flesh it may be distinguished from the orange-fleshed varieties hitherto known in this country, some of which have likewise sweet kernels, such as the Breda, Musch-Musch, and Turkey. It is earlier than either of these.

XVIII.—*Edgings of narrow Turf as a Substitute for Box and other Plants in the formation of Geometrical Flower Gardens on Platforms of Gravel.* By James Duncan, C.M.H.S., Gardener to Joseph Martineau, Esq., F.H.S., Basing Park, near Alton.

(Communicated August 25, 1848.)

Some thirteen years since, when re-arranging and extending the gardens and pleasure-grounds at this place, it was determined to lay out a geometrical flower-garden, having a gravel walk surrounding the beds, in order to afford means of ready access to the flowers in all sorts of weather. This garden is situated on a platform on a level considerably lower than that of the main walk in its immediate vicinity; and from the latter not only the forms of the congregated beds and masses of flowers can be seen to much advantage, but the centre fountain and intervening spaces of gravel form also a considerable relief to the wide expanse of turf and the foliage of the specimens and masses of shrubs by which this garden is surrounded. To form an edging for these beds which should be at once appropriate for such a situation and of a character that would be readily kept in order was an object of much solicitude at the time, inasmuch as the edgings of box and other plants which I had hitherto seen employed in this description of garden had long appeared to me exceedingly meagre in character and but ill suited for the purpose for which they were employed. I therefore had recourse to an edging of turf of very narrow dimensions, and than which nothing can harmonize so well with the gardenesque character of the scene I have just been describing, or form an edging more pleasing or neat in appearance.

Turf, the herbage of which is composed of the finer grasses, and of the description usually found on downs or sheep-walks, is best for the purpose. It should be cut into strips precisely one inch in width, and of such length as not to be inconvenient to the operator in laying it down. A lath should be used in cutting it to the proper width. Place it firmly on the turf, and cut on either side with a strong sharp knife. Before laying down the edgings care should be taken that the forms of the beds are properly marked out on the ground. The soil intended for the edging should be of a sterile character, so as to insure a dwarf growth; and on this condition being rigidly complied with will depend much of the future neatness of the edging, added to which, it will greatly abridge the amount of labour required to keep it in proper order. The strips of turf are readily adjusted to the forms of the beds; they should be slightly beaten down, so as to encourage the roots to grow at once into the new soil—

a matter of some importance should the weather be dry at the time of laying. The only keeping such edgings require is clipping with the garden shears, and this is effected by operating on either side, so as to form an apex in the centre. When properly trimmed the base and sides will form an equilateral triangle, each side being an inch in length.

These edgings have now been down for thirteen years, and I am so well satisfied with their utility and general appearance that I would not substitute for them any other description of living edging that I have yet seen employed in similar places. Turf, whether in regard to its appropriate character, to the situation it occupies, the neatness it displays, the readiness with which it can be employed, the little trouble that is requisite to keep it in perfect order, or the smallness of its dimensions in affording but little shelter to insects—which every gardener knows to be a matter of no mean importance—answers the purpose admirably.

XIX.—*Hints on the Cultivation of the Genus Epacris.* By Robert Reid, C.M.H.S., Gardener to Mrs. Clarke, of Noblethorpe.

(Communicated November 10, 1848.)

This useful genus, which is yearly becoming more interesting by the addition of new varieties, almost rivals heaths in beauty, and must doubtless soon receive more extensive cultivation than it has hitherto done; for Epacrises are much better adapted for mixed collections than heaths, both on account of their more robust habits and the certainty with which they can be brought into flower at almost any given time, but more especially in the winter season. The following hints therefore on their cultivation may be found to be deserving of attention:—

With respect to propagation and soil they require the same treatment as heaths. I have tried a little loam with peat, but find they always thrive best in sandy peat alone. The time for shifting can hardly be fixed, but it should mostly be done betwixt the months of January and May. My practice is always to shift when the plant has done flowering, whatever time that may happen to be. The first thing to be effected before shifting, is to carefully cut down and thin out the small shoots, which should be cut to various lengths and heights according to the size and strength of the plant. The rule is to cut low enough to cause the plant to break, down close to the surface of the soil, so that every part may be fully clothed with a sufficiency of young flowering shoots; for the main point to be considered in pruning is to produce a regular crop of well-ripened young

wood, on which depends the future display of blossoms. When the plant is properly pruned and shifted it should be at once placed in a warmer atmosphere, there to grow and ripen its wood. During its growth stop the young shoots frequently, more particularly of the strong growing varieties, such as Grandiflora, Impressa, &c. These should often be stopped, say at 6 or 8 inches, for if allowed to grow too long they will be destitute of flower-buds and will require support from sticks, which should be avoided as much as possible. It will also be advisable, where the shoots are too thick, to take them off close to the stem, so as to prevent them from growing again.

Having no other convenience at this place, I grow my Epacrises in the pine-stove, where, although they do very well, yet the hot sun is almost too strong for them; for towards the middle of summer it causes the young shoots to droop. A pit where they could be shaded, or a vinery, would, I should think, be more suitable for them; but where none of these places can be had, then they must occupy the warmest part of the greenhouse; and when this is so the plants should not be pruned so closely as when heat can be had, for the young shoot will not in that case grow so long, and will consequently ripen sooner. The plants should never be turned out of doors at any time, except when they have been grown in heat and the wood brought to maturity early; then a few weeks out of doors will be of benefit to them, rendering them more hardy for the greenhouse in winter. The advantages of growing Epacrises in heat, consist in the certainty of having every shoot covered with flowers; and by placing the plants in heat at different times, a constant succession of flowering plants during the winter and spring will be obtained.

By carefully attending to pruning and growing them in heat, Epacrises may be kept handsome in appearance, and in good health, for many years, and will never fail to produce a regular crop of bloom in due season. It is well known, and perhaps still believed by many, that E. grandiflora was considered a shy bloomer: the reason of this is, that being always grown in the greenhouse and the shoots allowed to attain any length without stopping, they never got properly ripened, and the few flowers that did expand were only on the smallest and shortest shoots, which ripen early; this shows the necessity of having a supply of these short shoots on every part of the plant. The more weakly growing kinds, such as Pulchella, will not require to be so severely pruned as the stronger kinds; judicious stopping will mostly be found sufficient for them. Watering should be carefully attended to during their season of growth; they require a good deal at that time.

XX.—*On permanent Studs as a means of Training Fruit-trees on Walls.* By Mr. Fleming, C.M.H.S., gardener to the Duke of Sutherland, F.H.S., Trentham Hall, Staffordshire.

Having been convinced that disadvantages attended the common method of training fruit-trees on walls, I tried the following plan, which I have practised for these last six years, and which I have found to answer perfectly.

The old method consisted in fastening the trees to the walls by means of nails and shreds of cloth. The nails are inserted where they are most useful for the season, but they must be removed every winter when the trees are pruned and fresh trained. In the operation of unfastening a portion of the mortar is loosened and brought away with the nails; and as the old holes seldom happen to be in the right place for the new arrangement of the branches, the nails are inserted in fresh places every year. The repetition of this process for a number of years causes the walls to look like honeycombs, materially injures them, and affords a permanent harbour for insects. The neat and convenient training of the trees in future years is in a great measure prevented, on account of the difficulty experienced in finding mortar sufficient and sound enough to hold the nails. In flued walls it not unfrequently happens that the nail-holes open a communication with the interior, and allow the smoke to escape amongst the leaves and fruit. In order to render the walls more sightly, in some places they receive a coat of colouring occasionally; but this practice offers considerable annoyance to the trainer, who may often rap his fingers twenty times before he finds a place solid enough to insert a nail in. The difficulty of fixing nails in the joints compels him to drive them into the bricks, and this gives the walls a most unsightly appearance. Another disadvantage connected with drawing cast-iron nails is their liability to break; and if wrought-iron ones are used a much greater expense is incurred.

Placing wire-trainers on walls has been recommended as a substitute for nails and shreds, but there are several objections to this plan; one is the inconvenience occurring from young shoots getting behind the wires, and another is the distance at which the trained shoots are kept from the wall, thereby depriving them in a great measure of its warmth. Wiring walls is also much more expensive than the system I am about to recommend, not a whit more convenient for the trainer, and rather worse for the trees, as the shoots, unless made objectionably fast, are liable to become half-sawn through by rubbing continually

against the wires. Wiring is, however, not only useful but necessary against the lower flues in hot walls, where the heat is occasionally liable to become so great as to make it dangerous to have the shoots in immediate contact with the surface of the bricks; but this is the only place in which it can be employed with advantage.

The plan which I have adopted, and which I beg to recommend as superior to either of the above methods, is to drive permanent studs into the wall, and to tie the shoots to or between them with bast. The studs I use for this purpose are common cast-iron nails with square heads, and the expense of furnishing the walls with these is little more than the cost of the new nails required during a few years' training in the ordinary way. For fan-trained trees we place the studs 8 or 9 inches apart in every course of bricks; but for pear-trees trained horizontally, they are sufficiently close in alternate courses. The studs are prepared by heating them till red hot upon an old shovel, or some such appliance, and then precipitating them into a can of boiled oil; in this way corrosion is prevented, and durability ensured. As the whole of the wall is at once supplied with studs, a little attention to inserting them in straight lines and at regular distances gives a pleasing appearance to those parts of it to which the branches have not yet extended themselves. The easiest way of proceeding is to procure a straight board, $4\frac{1}{4}$ inches wide, and as long as the wall is high; after the first perpendicular row is inserted in the alternate courses, one edge of the board is placed against them, and a straight line drawn down the other edge as a guide by which to drive the second row in quincunx order, and so on till the work is completed. The upright lines should be proved with the plumb-line once in 4 or 5 yards, in order to prevent any deviation from the perpendicular.

By this method the walls are kept good, all harbour for insects is avoided, and the trees are trained at much less expense than they can be with nails and shreds; the cost of the shreds nearly balances that of the bast required for tyeing, but the labour of cutting them into suitable sizes is saved, as is also that of straightening and pointing old nails, and after the first few years the cost of the nails themselves is saved. A good workman will do twice as much tyeing as he would of nailing; while the appearance of a tree bandaged with rags of all colours is not to be compared with that of one whose neatly trained shoots form right lines at equally divided angles, and which exhibits no ornaments save leaves and fruit.

The walls at Trentham had become so battered and disfigured that it was necessary to repoint them, and to plaster up the

holes in the bricks, in order to bring the whole to an even surface. To conceal this patchwork the walls received a coat of stone-colour, and by this means all insects are effectually smothered; this is repeated once in two or three years, taking care not to let the material fall upon the branches. The proportions of the ingredients used in forming the colour are as follows:—16 lb. umber, 4 lb. ochre, 1 lb. lampblack, and 4 quarts of coal tar; these are boiled together in 30 gallons of water, and applied to the walls as hot as possible. To destroy any insects which are on the trees themselves, they are painted with a mixture composed of about ½ a lb. of soft soap, and 1½ lb. of sulphur, to 8 gallons of water, with sufficient lime and soot to bring it to the colour and consistency of darkish-coloured paint.

The following statement shows the difference in cost between copper-wire, iron-wire, and plain studs:—

100 square yards of wall will require, on	£.	s.	d.		Cost per sq. yard. s.	d.
The Stud system, 5000 cast-iron studs, wt. 50 lbs. at 1½*d*.	0	6	3	..	0	0¾
The Wiring system, with iron wire, 600 drilled studs, 30*s*.; 1200 yds. iron wire (No. 12), 112 lbs. at 3½*d*., 32*s*. 8*d*.	3	2	8	..	0	7½
With copper wire (No. 15), which is much neater in appearance, but will cost	5	17	6	..	1	2

The preservation and improved appearance of the walls, and the saving of labour effected by an outlay which is so soon returned, should be sufficient to induce all who have walls for fruit-trees to adopt the plan. I may add that many have already done so, and the advantages connected with it have not fallen short of their expectations.

XXI.—*Some Observations on the Growth and Maturation of the Wood of Plants.* By George Lovell, Gardener to the Marchioness of Hastings, F.H.S., at Efford House.

THAT the fertility of any given plant in reference to the production of flowers or fruit, or both, is in direct ratio to the degree of perfection attained in the maturation of its branches, no intelligent cultivator dreams of denying; but in the many varieties* of structure in plants with which the gardener has to deal, the phenomena attendant on, and constituting the development and solidification of a branch are of so diversified a character, that I presume the subject is not generally well understood.

* Of course the word is only used in the general sense, and not botanically.

And when we take into consideration the importance of the question, which is nothing less than the ground-work of the science of plant-cultivation, the superstructure upon which alone success can be raised, it will not, I think, be too much to occupy a page or two in the Journal of the Horticultural Society, in which to give a few ideas drawn from the best of all sources —personal observation.

When we investigate the principles of success in any instances of extraordinary development, we shall perceive that though those may appear fortuitous, though they may have arisen without any recognized efforts towards an end by the cultivator, yet those *effects* have not been produced without a *cause.* In other words, that certain unintentional operations or circumstances have been afforded, and the results are such that if similar circumstances were employed as a means towards a desired end, like results must inevitably follow. A remarkably fine specimen of any given plant is not produced miraculously, even though the results produced may have arisen from causes not understood. But as certainly as a complexity of calculations are indispensable to the correct arrival at a mathematical solution, so is a certain series of processes necessary for the development of the higher capabilities of vegetable life. For plant cultivation in its most extended and scientific application is but the science of development. We can create nothing; we can only develop.

In common garden phraseology, plants are divided into two great divisions; hard and soft wooded. But these vague terms must be considered as of a very arbitrary character, conveying as they do but the mere outlines of a complicated series of developments—complicated, inasmuch as that a vast diversity of character in the processes of elongation and solidification of a shoot is observable in different genera, or perhaps more properly, different families of plants. In some, the growth and subsequent maturation are two entirely distinct processes, each process taking place at a period separate from the other. A type of this character of growth is strikingly apparent in our common Pinus sylvestris. In this tree the utmost extent of the elongation of the current season's branches is attained in a wonderfully short period of time. In favourable seasons a shoot of 12 or 14 inches in length will have been produced in as many days; but, at the expiration of that period, little or no distinction of parts has been effected: the foliage is rudimentary, and its perfect development is a subsequent process. Other instances of an exotic nature are offered to us in Inga pulcherrima and Rhododendron arboreum, and the reader will instantly recall many others. Now before I proceed to other peculi-

arities of growth, it will be as well to remark that this wonderful rapidity of elongation is effected almost entirely (in many instances quite so) without any root action. Upon examination it will be found that the roots are as dormant as at mid-winter; but immediately on the completion of the process, and when maturation commences, all the root resources of the tree are put in motion to recruit its exhausted energies, to afford organizable matter for the perfection of the current season's growth, and to store up matter as a reservoir from which the growth of the ensuing spring is to derive its substance. Other varieties of growth are presented to us in plants of the "hard-wooded" class; but unlike the instances just enumerated, the growth is comparatively slow, and both the processes, elongation and maturation, are taking place at the same time and in the same shoot. Pimelea, Erica, Epacris, and genera of a similar character are familiar examples. Here is no extraordinary rapidity of growth, no distinction of processes. The base of a shoot half a dozen inches in length will give every character of development from perfect maturity to simple cellular tissue which the pressure of the finger would crush. Here we find a great distinction in the phenomena of elongation. In the Rhododendron all the matter forming the current season's shoot had to be derived *directly* from the *past* season's growth. In the Erica the foliage of a shoot of the current summer, of a shoot still growing, is capable of elaborating matter for the elongation of the growing point. Another peculiarity of growth is observable in those numerous plants of quick growth from which we obtain both wood and flower in a comparatively short period, the production of such having only an indirect relation as regards beauty or abundance to the strength or vigour of the plant during the past season of growth. Of this class I may mention Geranium, Justicia, Poinsettia, and all such plants as are pruned back to within a few buds of the old wood, the aim of the cultivator being to produce an entire new growth for the production of foliage and flowers.

Now it must be obvious to the most cursory observer, that the phenomena of growth, and the organic development of each of the three peculiarities of growth which I have instanced, must differ widely; or, in other words, that the constitution of each must bear a totally different relation to the same external circumstances. Taking the growth of plants in its widest application, three distinct processes are exhibited to us, viz., that of furnishing matter for the current growth; recruiting the exhausted energies of the plant, and furnishing materials for solidifying that growth; and storing up organizable matter available for a new growth in the ensuing spring or season of growth.

Amongst the numerous favourites to be found exhibiting that peculiarity of growth, a good type of which is afforded us in our common Scotch fir, may be instanced the Camellia, and it will furnish an excellent subject upon which to illustrate my observations. All those who aspire to scientific cultivation and its consequent results defer repotting this plant till after the current growth is completed, and the flower-buds in process of formation. The reason assigned for this mode of treatment is that by limiting the action of the root during the period of growth, flower-buds are more readily formed and the young wood is less luxuriant. Now I deny that the period of repotting the Camellia, or indeed any plant exhibiting a like peculiarity of growth, has any effect whatever upon the extent of the *current growth.* You may shift it before its wood-buds are fairly expanded, and at the period when you can distinguish its bloom-buds, and no material difference of quantity in its growth will be effected, provided that in other respects the treatment is such as to prevent a double growth. I need not say that Camellias may be induced, and often are so, to make more than one growth; such is of course under the cultivator's control: but when such does take place, growth is not continuous; there is a period of rest, even though no cessation of the stimulant to growth is allowed. The peculiarity of the mode of development of the organization of the Camellia is such that a continuous growth is impossible. It increases its stature not by a gradual progression, but by a series of impulses, each impulse being in direct ratio to the quantity of organizable matter stored up by the plant subsequent to and during the growth *immediately preceding.* The influence of the root upon the elongation of the wood is only indirect, and it does not affect in any direct way the extent of that growth. If an extensive medium for the roots, with an abundance of food, influenced the foliation and inflorescence, how comes it that plants in the open borders of a conservatory exhibit such masses of bloom? The roots of plants are but extensions of that cellular mass from which all parts of a plant take their origin, and root action is simultaneous with the accumulation of that organic matter in the substance of the plant, and no deposition of such organic matter takes place in plants exhibiting such peculiarities of growth as those of which I am writing, until subsequently to the cessation of growth. Good illustrations of this are found in the phenomena attendant upon the process of grafting plants of this description. Success in the operation does not involve any amount of skill, but yet it often occurs that many failures arise, and these failures originate from unexplained causes.

Often those cases on which we have bestowed the greatest care

will prove failures. Let us inquire into these failures. The success in grafting the walnut, recorded by that most acute observer and profoundly scientific horticulturist, Mr. Knight, is, I am inclined to imagine, to be attributed not so much to the changes in the chemical composition of the sap in that tree at particular periods, and in deferring the operation of grafting till that period, as to the fact that the elaboration and accumulation of organic matter is subsequent to the elongation of the current growth. It is an axiom in the practice of grafting that the "stock" should be in advance of the scion. In ordinary cases, such as the apple, pear, all our common fruits, and many other instances, it is sufficient that this be the case only in a slight degree. In the apple it is not necessary at all. Countrymen are constantly in the habit of grafting the apple on crab-stocks by their fire-sides, after their day's work is finished, in early spring, and transplanting them in their gardens at pleasure, and failures are but slight exceptions to the general rule. The true principle upon which this readiness to unite between stock and scion is to be accounted for is, that the process of organic development in the apple is of a nature to admit of such, its phenomena of growth being totally opposite to a Scotch fir or a rhododendron. Every gardener knows perfectly well that in grafting camellias, or any of the Conifers, if the scion can be kept alive after the operation till the stock has made its growth,* success is certain. At that period the stock is beginning to increase its bulk, and new matter is secreted to repair the wound made to insert the scion, and an union is the inevitable result.†

From this circumstance is inferred the advantage, the greater probability of success, in deferring the operation of increasing many plants by the various modifications of grafting and inarching till the season's wood is completed. Here is one of the many applications of scientific data, of theoretical reasoning, to ordinary practical operations. Every operation which we perform, guided by practical experience, may be successfully calculated upon by

* I am here speaking of grafting, without heading down the "stock," a mode adopted to preserve the "stocks" for a successive operation in cases of failure.

† Here we see the true causes of almost invariable success in what is technically termed "bottle grafting." The facts are simply these:—if the scion is bound to the stock at a period when its condition is such as not to allow of a sufficient deposition of organic matter to repair the wound and effect an union of tissues, the chances are that the scion will perish before that union can be attained, unless some provisions are made to obviate this inconvenience and consequent failure. The phial effects this, by affording nourishment sufficient to prevent decay, and preserve vital energy in the scion, till the scion and stock are, as regards the phenomena of life, one individual.

reasonings upon scientific data. Many other important results arise from a knowledge of the peculiarity of the growth of plants. Still speaking of the Camellia, if this plant is removed, suppose it to be growing in the open ground and its roots mutilated in the operation (and in moving such plants mutilation takes place to a great extent from the nature of the root), the extent of the current wood will be scanty in proportion to the extent of root to be renewed. This arises from the fact that the organic matter stored up in the tissues of the plant, and which under favourable circumstances, *i. e.* had the plant not been removed, would have been employed in the formation of wood, is appropriated by the plant to repair its sustained injuries, consequently it is recommended to remove such plants when their growth is completed. But the advice to repot Camellias, and in which operation no mutilation will occur at such a period, will be productive of no advantage, because repotting before growth takes place, if all subsequent treatment is as it should be, will not be productive of an extended growth.

Deductions from these phenomena, of practical application to the gardener, are numerous; this is however not the place to apply them. I shall now offer some general observations in connection with that character of growth as manifested to us in the Erica and similar plants. These plants exhibit a mode of elongation and maturation which, although materially differing in individuals of the same genera, yet as a whole evince peculiarities decidedly opposite to those before described. Speaking of individual peculiarities, I may mention as decided contrasts, Willmorei superba and Aristata major, or Bergiana and Banksiana. Willmorei will produce blooming shoots, 12 or 14 inches in length, Aristata but a tenth of this, and yet the growth of each will be perfect of its kind. It is not, however, of extent that I am writing, but of the manner by which that extent is produced. Strictly speaking, Heaths, and many other plants of a like character, are never totally inert as regards growth, but both processes, elongation and maturation, are carried on at the same time. Now it is evident that such a mode of growth is quite distinct from that of a Rhododendron; yet both are "hard wooded" plants. And it is equally evident that to profit by a knowledge of this peculiarity, a totally distinct line of treatment must be afforded. In the Rhododendron (I merely select that as a type), the wood for the season is made entirely at the expense of shoots previously formed, and the great business of life in such plants is to recruit that exhausted strength, and to prepare for a future drain upon its resources; and this is only accomplished subsequently to the elongation of its wood. Now in the Heath there is a constant elongation, except perhaps when the

flowers are about to expand, and at the period of fitness for fertilizing the embryo; and consequently there must be no long period of cessation in the healthy action of the root. This is why Heaths are, under an artificial course of treatment, so difficult of management; and why, when their roots are in any way deranged, the foliage so soon bespeaks ill health; when also in this state growth will not take place, and unless prompt means are taken death must ensue. No plant has less cellular matter in its structure than a Heath. As I have previously observed, perfect organization will have taken place at the base of a shoot but a couple of inches in length, and while its point will be in the first stage of development; and this circumstance accounts for the feebleness with which a Heath "breaks" when pruned in the shoots of more than one season's growth. It is deficient in cellular matter, the primary form of all subsequent stages of a shoot.

In glancing at another peculiarity of growth, of which, perhaps, a Pelargonium is as familiar an instance as could be selected, we meet with a perfectly distinct mode of development. When we cut back a plant of this character, however severely the operation may be performed, we are confident that new shoots will present themselves, even though no moisture be allowed to the roots; and this circumstance arises from the great amount of *undeveloped* organized matter which abounds in the whole substance of all plants of a like character. In such instances we know that the perfect maturation of the shoots, from the bursting of the young bud to the perfection of the seed, will take place in a few months, and consequently we may be said to create a new plant every season, because we know that in that brief space we can attain our aim. Precisely a like routine of rapid organization takes place in annual plants, a more prolonged one in biennials, and the same end is only attained in the protracted development of an Aloe or a Palm. In fact, we must be aware that every plant, before it can produce perfect flowers or fruit, must go through a certain series of developments; that different varieties of plants have different degrees of perfection in that development (taking the more protracted as types) to pass through, before the great end of all organized beings, reproduction (or the organs of such), is perfected.* And we can also infer that the several

* Mr. Knight was of opinion that accumulated matter of succeeding *seasons*, not only that of the current growth, influenced the degree of perfection of a given crop of fruit or flowers. In this we must all concur; and the acknowledgment of the principle involves much for serious consideration. and much that bears directly upon plant culture. In an annual, the present season, or more properly one circle of organic phenomena, is all that is afforded to accomplish the great end of life. An Amaryllis, mutilated at the season of vigour, requires three or four such circles of organic development to enable it to perfect its flowers, and with the best treatment too.

stages of development may be performed, perfectly or imperfectly, accordingly as external circumstances may influence. And in arriving at this point we are bound to conclude that, supposing the principles which I have pointed out, to be based upon fact, and that the cultivator is guided in his operations by inferences drawn from reasonings upon such principles, then plant cultivation must be classed amongst the sciences.

With this rapid and imperfect sketch of some of the principles upon which the growth of plants proceeds, I shall endeavour to inquire how far some of our treatment, as regards temperature, harmonizes therewith. We all know too well that the "head" of a plant may be over stimulated—that its branches may be induced to extend themselves at the expense of their bulk. No matter what description of growth the plant may exhibit to us, the principle holds good in all. A plant in such a condition is derisively termed a "lanky" specimen, and indicates bad gardening in many instances. One of the cultivator's most strenuous endeavours is to guard against such effects, and every means is employed to combat them; yet it appears to me, that in the face of such facts, we all practise—and the best gardeners in England sanction and recommend it—that which is of all treatment the most likely to bring about results that we profess to abhor and to combat. The treatment I allude to is that of shutting up plant-houses at an early hour in a sunny afternoon, with a damp atmosphere and a thermometer 10° or 15° in advance of a gradual and natural decrease. Ever since I have reasoned upon the connection between cause and effect in garden matters, this has appeared to me to be a monstrous innovation upon those laws we are all so fond of acknowledging as the guiding star of our operations—the laws of nature. I have reasoned upon the practice often; I have brought what smattering of physiological and practical knowledge I possess, to bear upon the subject; and I must, in justice to myself, confess that I can deduce nothing in favour of the practice, but very much against it. I will willingly change my opinion if I can read or hear a sound argument to convince me that my opinions are wrong. But in the present state of my researches and observations, I cannot understand *why* the practice is recommended, or what are its good results. I conceive it to be one of those time-honoured practices which we still so fondly cling to, without for a moment considering the *rationale* of such proceeding; but in the present advancing state of gardening, when every day enlists more of intelligence and forethought in its service, the principle must be investigated and retained, or condemned, as shall be decided.

If we discuss the subject upon purely scientific grounds—and that we may safely do, for the most successful practice is but the

elucidation of scientific deductions—I think we shall see that the practice of early afternoon closing is detrimental to the proper and perfect development of vegetable life. It may, and does, induce elongation, but that is no gain, as regards actual bulk of organized matter in the plant. It is essentially a species of wire-drawing, in which the same matter is lengthened and made to *assume* a more extended bulk without such actually being the case, and at the same time the original is weakened: it gives, as it were, an impulse to growth at a season when a degree of repose and solidification of pre-existing tissues should be going on: it deranges the circle of organic phenomena, and consequently depreciates the capabilities of the individual. For it must be borne in mind that the tissues of a plant once advanced in the scale of organization beyond the simple elementary form of cellular tissue, can never retrograde: they may possibly remain stationary or be imperfectly advanced, as is both the cause and effect of some diseases; but if that advanced condition has taken place under unfavourable circumstances, the ill effects of such must remain indelibly fixed as a constitutional derangement, and as such will ever after influence the perfect development of the individual. It appears to me more and more forcibly, with every successive inquiry I make in the subject, that horticulture as a science must be based upon physiological facts, and that physiology must consent to descend in some degree from the elevated position it assumes, and condescend to deduce the basis, the foundation of its theory, from investigations of the simplest forms of vegetable life. The whole series of phenomena constituting the origin and maturity of some of the lower forms of plants are but the first steps of organization in some higher in the scale; but each is perfect of its kind. And it is in its most simple form that we can observe with advantage the phenomena of life. It is here we must study the connection between the constitution of vegetables and the external circumstances to which they may be exposed, and the results produced in subsequent stages of development. A physiology based upon such principles can alone be of real worth in its practical application to horticultural purposes.

XXII.—*Contributions to a History of the Relation between Climate and Vegetation in various parts of the Globe.*

No. 9.—*Climate of Australind, Western Australia.* An Extract from a Letter to the Vice-Secretary from M. Waller Clifton, Esq., dated 25 September, 1848.

When I came out in charge of the expedition to found this settlement (the success of which was almost at once destroyed by the proceedings and failure at home of the Western Australia

Company), I brought with me a case of vines and figs, and some seeds from the Society, as well as a large supply of fruit trees and garden seeds which I procured from nurserymen and from my own gardens; but, unfortunately, from their getting wetted in landing and the difficulties incident on the formation of a first settlement, I preserved only a limited part of them. I could only plant and sow them in sand near the coast, and before we had manure or could bring the fertile soil into cultivation; and, of course, under such circumstances, few of the fruit trees were preserved. I soon, however, brought the *sand* of which my first garden consisted into fine cultivation, and it is impossible to describe too highly its productiveness and the superior qualities of the vegetables it produces. I have since, at a farm which I have formed on the banks of the Brunswick, a small stream running from the Darling Range to Leschenault Inlet (about five miles from hence), formed two other gardens, one in alluvial soil on the flats of the river, and the other upon upland of a loamy character above the flats, in which the vine, olive, banana, and every European fruit tree and vegetable thrive with the utmost luxuriance.

I should inform you that, although we are in 33° S. latitude, the heat is not greater than in 45° N. latitude. Our climate is perfection: in the summer, which I may say lasts from October to April, we have land and sea breezes, which entirely temper the heat; the nights are scarcely ever hot, and even in those months we are seldom more than three or four weeks without beautiful soft rain. In the winter months the weather between the intervals of gales and rain is most exquisite, and, in fact, is never really bad for three days together. This year we have had more rain than usual, but the season has been most delightful for agricultural and horticultural purposes. (The rain that has fallen in the present year amounts to 28 inches in perpendicular depth to this time; I think about 25 may be the average.) With such a climate, you may well suppose that *kitchen* gardening may be carried to the utmost perfection; and, having all my life taken great delight in it, I here enjoy it to the full. I regularly get *two* crops, and in some instances three crops, off every inch of my gardens. My peas and lettuces, turnips, carrots, and cabbages surpass what I ever saw in England or France; my onions last year weighed 17 oz. each, and cucumbers, melons, water-melons, and vegetable-marrow I have *actually in cart-loads* from December to April. We sow potatoes in February and March, *before* the rains commence, dig them in June, sow again (old seed) in July during the rains, and dig in October and November, and sow again in swampy land in November, December, and January, and dig in February and March.

The growth of the vine and fig is here something wonderful. I should tell you, that for the last seven years the cultivation of the former, which was neglected in the early days of the colony, has been much attended to at and about Perth, the capital, where, though only $1\frac{1}{2}^{\circ}$ farther to the north than I am here, the heat is much greater. Wine and raisins are now making there in considerable quantities, and more might, I think, have been done, had it not been for unacquaintance with the culture and pruning. The *short* system of pruning there, adopted recently, has nearly destroyed many of the vineyards before they had reached perfection. In this district one other gentleman and myself and sons are at present the only cultivators of the vine, and it is only three years since I planted my first. The prospect is so flattering, that I have now above an acre of trenched vineyards, and have just planted out about 3000 *more* plants. To give you an idea of the growth of the vine here, I need only mention that on the 6th of September, 1846, I planted at my farm 400 2-year old vine-plants which I procured from Perth, and which, *in transitu*, were *two months* out of ground, and apparently dried up. Nearly all struck. They were planted in ground trenched 3 feet deep. In June, 1847, they were pruned close down; in January, 1848, they produced a considerable number of fine grapes; and when I pruned them in June last (1848), I cut off from many shoots *seven* yards in length. At this moment they are just bursting forth, and from the enormous show of fruit I think there will be a *ton* of grapes upon them in January. In my sand-garden here on the shore of the inlet their growth is hardly less. The fig is equally luxuriant and prolific; I shall have bushels and bushels on young trees only planted four years, and now eight and ten feet high.

Of vines we have here the following kinds: Sweetwater, Muscat of Alexandria, Red and White Constantia, White Hamburgh, Wortley Hall, Crystal, and some others not accurately known; but we are especially deficient in black grapes. In figs I have White Marseilles, Brown Ischia, and what is called here the *Turkey*, but which is, I think, the Brunswick or Madonna.

Of potatoes we (the colony generally) only have a *red* sort (I believe the Scotch Red), and I have a few Ash-leaved Kidneys and Pink Eyes.

The peach, nectarine, and apricot thrive here wonderfully. I am by degrees getting them, but generally the peaches are inferior sorts raised here from seed, and bear the third year. The black currant and raspberry might do here, though they do not at Perth.

Our melons, cucumbers, and vegetable marrow come here to a perfection I never saw in Europe. I picked the Netted Romana in my open *sand*-garden last year, weighing $19\frac{1}{4}$ lbs.

XXIII.—*Hints on the proper Management of Fruit-Tree Borders, having for their object the attainment of early and permanent productiveness.* By Henry Bailey, Nuneham.

(Communicated February 16, 1849.)

In making a communication to the Society upon a subject of so much interest to every lover of a garden, I may be allowed to say that I do so with great deference to the opinions of others. In treating the subject it will be my endeavour to advance nothing in practice which cannot be accounted for by science, being well assured that no dissertations, in this enlightened age, can be really valuable to the community which do not unite theory with practice.

The walls of a garden are amongst the largest items of expense in its first formation, but we may travel long distances without seeing (however complete in other respects gardens may be) these expensive provisions adequately furnished with well-trained and fructiferous trees, or if we see them *now*, in a few years they will have vanished. How often do we see trees growing in the wildest luxuriance during one season (perhaps a wet and sunless one), doomed to perish the next from their crude and immatured condition!

Various have been the suggestions of modern gardeners conversant with horticulture as a science, to control the vigour of their trees within certain limits, and to establish that desirable balance in them which, while they possess all reasonable strength of growth, does not prevent their producing abundantly. In old times it was said,

"He who plants pears,
Plants for his heirs;"

but in these days, thanks to Mr. Rivers, root-pruning, shallow planting, and the quince stock, where it flourishes, every lover of this valuable fruit can now look for and have immediate results.

Equally diverse have been the modes of planting trees on walls. In former times, when the importance of drainage was less understood—when the revivifying powers of atmospheric air in penetrating soils were chemically unappreciated—deep excavations were dug out, without provision for the water to escape, and filled with soil; the trees were planted, and left uncontrolled, save by the periodical prunings, till nature caused them to fruit, which they generally did in the most sparing and uncertain manner. It seems to have been an established principle in old times that the roots should penetrate *deeply* into the earth, no one reflecting that from this cause proceed late and immature growths, the sure preludes to decay and death.

It has been reserved for modern gardeners to appreciate the importance of the temperature of the soil in connexion with the growth of plants. I mean of the temperature of the soil, *being in advance of that of the atmosphere.* Mr. Reid, of Balcarres, "found that in a cankered orchard the roots of the trees had entered the earth to the depth of 3 feet;" and he also ascertained "that the average heat of the soil, at 6 inches below the surface, was 61°, at 9 inches 57°, at 18 inches 50°, and at 3 feet 44°." Surely, then, when we take into account the manner in which the earth's surface is heated by the sun in the native countries of the fruits which British gardeners cultivate, and when we understand the advantages which the *comparative* bottom heat confers on trees, in causing early and advanced root action, moderate growth, and early maturity of the wood, at the same time endowing them with protective properties by diffusing through their air-vessels that temperature which the surface-roots absorb, it cannot but be wise practice to adopt shallow platforms of good sound loam on well-drained bottoms impervious to the descent of roots. Such has been my practice—such the plan advocated by one of our most skilful gardeners, Mr. Errington, gardener to Sir Philip de Grey Egerton, Bart., M.P. By such means, in almost all situations, fruit-trees may be made to flourish and yield fruit "after their kind."

There is another advantage which these impervious bottoms secure to us, viz. the most perfect command of the roots; and I think there are few who in this age would hold this to be unimportant. For my own part I conceive that the roots of every fruit-tree should be as much under control as the branches.

Of late years there has been practised by several very intelligent men a system of covering the surfaces of borders with concrete, thereby excluding the rain-water from percolating, and preventing, to a great extent, the admission of air. I am quite willing to admit that in certain places, where the situation is low, the soil tenacious, and the locality subject to an amount of rain exceeding the average, it may have been wise to make provision to prevent the saturation of the border by excess of rain; but as a general rule on light soils, or those of a medium quality, it does not appear to me that such a proceeding is either *warranted by practice* or *supported by scientific theory.*

If it be true that "the water which plants obtain from the soil contains those saline and gaseous matters which plants want," surely it cannot be in accordance with the established data on which the universally recognized improvements of modern horticulture and agriculture are founded, to exclude the rain-water from penetrating the soil. The advantages derived from drainage (the basis of all cultivation) are due to the removal of the

excess of water, thereby admitting the air—"Because," says Mr. Solly, "plants cannot derive the elements of organic matter from the earthy constituents of the soil, nor from the organic matters which it may contain, unless there is AIR present." Again, the same high authority says—"The most abundant constituent of soils is commonly *silica*, which frequently forms nearly nine-tenths of their whole weight. Silica, or natural compounds containing silica, in combination with several earthy and alkaline bases, are quite insoluble in water, and are scarcely acted on by the strongest acids, nevertheless they gradually decompose *when exposed to the* AIR."

Seeing, then, the very important functions which rain-water is ordained to perform in percolating through the soil—water itself being a large constituent of plants, containing also in its own body a quantity of air, and in its course leaving cavities through which the air of the atmosphere penetrates, rendering into soluble food for plants those organic substances which without such agency would be insoluble—I cannot but doubt the propriety of covering the surfaces of borders with an impervious substance like concrete.

Dr. Lindley says, that "hardy trees, on whose roots earth had been heaped, or paving laid, are found to suffer much, or even to die. In such cases the earth, in which the roots are growing, is constantly much cooler than the atmosphere, instead of warmer." Is there not on this account another great objection to concrete surfaces?

I have paid much attention to the management of fruit-tree borders, and feel convinced that the great object which we should have in view is to secure a shallow stratum of sound pure loam on a dry and impervious bottom, to avoid mutilating the surface-roots by cropping with vegetables, not to apply rank and stimulating manures, and to endeavour to keep the mass of soil always open, healthy, and permeable to the sun, the atmosphere, and the rain, using especial precaution that excess of the latter is not permitted to saturate the soil. Nothing in my opinion is more injurious to wall-trees than the heavy cropping of the borders in which they are planted. I would not do this if I were not obliged. My opinion is, that in first-rate gardens the fruit-borders should be set apart solely for the trees. If paled fences were erected, running east and west over a division of such gardens, northern and southern exposures for early and late cropping would be secured, offering the advantages of shade and exposure to the fullest extent, while the trifling additional expense would be amply repaid by the permanently-improved condition of the trees, and more abundant and highly-flavoured fruit.

XXIV.—*On the Cultivation of the Scarlet Pelargonium in Pots.* By Philip Conway, Earl's Court Nursery, Old Brompton Road.

(Communicated January 31, 1849.)

Having devoted a considerable portion of my time for these last twelve years to the cultivation and improvement of Scarlet Pelargoniums and with the best results, and having also been a successful exhibitor in this class at Chiswick as early as the year 1839, I am induced to give the Society a plain statement of my practice, which, if followed out, will be productive of a splendid and continuous display of bloom in the conservatory from May till November—surely a great desideratum.

About the middle of July select healthy plants, having from two to six shoots of young wood as close to the pot as can be obtained, and set them in a sunny situation. Give them little water for a fortnight; at the expiration of that period cut them down, leaving about two eyes of the old wood; set them in the shade, and water sparingly until they have broken well, which they will have done in about three weeks. Cease watering them then for two or three days, and when thoroughly dry shake them out of their pots, trim in any straggling roots, and re-pot into as small pots as the roots will admit of, shaking the mould well in among the fibres. When potted set them in the shade, and give them a good watering to make the soil firm, afterwards water sparingly until they shall have begun to grow freely, when they will require a more liberal supply, especially in dry hot weather, when they may be watered twice a day all over their leaves from a fine rosed pot. In about a week or ten days' time they should be removed to a situation where they will be exposed to the full influence of the sun during the greater part of the day. When they have well filled their pots with roots, they should be shifted into others two sizes larger than those they occupied, and in these they should be flowered. About this stage of their growth care must be especially taken to rub off all young shoots, except one or two on each main branch, and these should be as equal in size and strength as possible all over the plant, in order that they may all flower at the same period, which they will do or nearly so, provided too many be not left on the plants; and, as large trusses of flowers are more attractive than small ones, though there may be double the number of the latter, it is necessary to encourage the strongest and healthiest shoots only. I should say that for a plant in a 6-inch pot two shoots would be sufficient to leave; for one in an 8-inch pot three or four; and for one in an 11-inch pot from four to six. The grand point

being, as before stated, to get all the shoots left on the plants to bloom at the same time: the trusses will keep in perfection for a month or six weeks. A strong one-year old plant, with a single stem, flowered Hydrangea-fashion, presents a superb appearance.

In staging the plants for the winter they should be placed as near the glass as possible, and no more water should be given them than what will merely keep them from flagging.

About the beginning of February they should be introduced to the forcing-house, and placed where they can receive the greatest amount of sun. They will now require an increased supply of water; and when they shall have commenced growing vigorously, and while throwing up their flower trusses, they like a copious supply, in bright dry weather sometimes twice a-day, gently syringing the foliage and flower-trusses with a fine rosed syringe morning and evening. Liquid manure made from sheep's droppings, applied two or three times a-week, will add much to the strength of the truss of bloom and to the beauty of the foliage, but this should not be applied till the flower-trusses have made their appearance. As soon as these can be plainly distinguished from the points of the shoots, the latter must be carefully nipped off immediately before them, the flower-stalk will then take the lead and grow most vigorously. A stake will be required for each shoot, but it should not show above the foliage; the flower-stalk will be sufficiently strong to support the truss. Soon after the shoots are stopped they will send out laterals; these should be picked out with the point of a knife on their first appearance, in order that the whole energy of the plant may be directed to the main shoots and flower-trusses. By the middle or end of May plants treated as above will be in excellent order for the conservatory, and when placed there it is absolutely necessary to avoid all extremes in regard to watering, or the consequence will be that the foliage will assume a sickly hue and prematurely drop off, and the flowers will not be so persistent or long-lived as if the soil were kept in the happy medium between wet and dry. These are facts borne out by experience, and I am anxious to impress them on the minds of my readers.

When the beauty of the plants begins to fade they should be turned out to harden off previous to their being cut back in July, being intended for the first blooming in the following May, and the conservatory should be replenished by a batch cut down early in September. When the latter have broken, are shook out and re-potted, they should be kept as dormant as possible all winter. In April they must be shifted into large pots, and at once introduced into the forcing-house, where they should receive the same treatment as the former lot.

The plants for the third succession must be selected from those cut down in September; they should be introduced into the forcing-house in April along with the others; they should not be shifted then, but stopped back, and when they have broken they should be shifted, and afterwards treated in all respects as the former lots.

The soil which I use for my plants consists of equal portions of rich friable loam, leaf-mould, and well-decomposed cow-dung, mixed with coarse silver sand and lime rubbish to the amount of about one-eighth of the whole: these should be well incorporated with a spade, but not sifted. For large plants especially ample drainage is essential—say a few oyster-shells, and over these an inch in thickness of the rough siftings of old lime rubbish, then a layer of flaky hot-bed manure. I would here remark that during their earlier stages of growth, the soil should not be of so forcing or heavy a character as for more advanced plants; I mean it should contain more sand and less dung.

The stronger growing sorts of Pelargonium most suitable for the above rotation are, the Shrubland Superb, Ibrahim Pacha, Royalist, Tam O'Shanter, and Eclipse.

The best dwarfs are, Phenomenon, Brompton Hero, and Tom Thumb; the latter variety requires a much larger proportion of cow-dung and leaf-mould, to grow it well, than any of the other sorts, and it is the only one with which I am acquainted that will bear forcing. They should be stopped once or twice during their earlier stages of growth, which will cause them to assume a more dwarf and bushy habit, but they must not be stopped before their flowers, like the large growing sorts.

XXV.—*Notes upon some newly-introduced Conifers collected by Mr. Hartweg in Upper California.* By George Gordon, A.L.S.

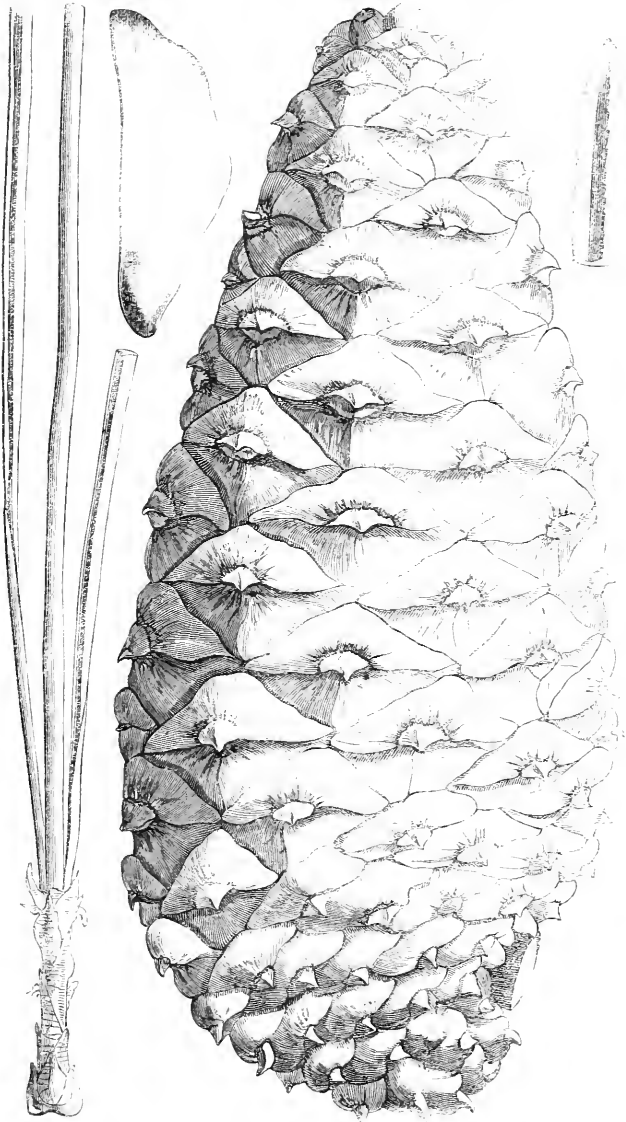
It has been known for some years past, from dried specimens and other memoranda brought home by the late Dr. Coulter, that several very desirable firs were to be found growing on the mountains of Upper California, some of which were of gigantic stature and well suited for the climate of England; and as Mr. Hartweg, when in the service of the Society as collector in that country, succeeded in procuring good seeds and specimens of most of them, which he brought with him on his return to England in June, 1848; and as a large quantity of the same have now been distributed to the Fellows of the Society, either in seeds or young plants, some account of the different kinds may be found serviceable, particularly as the names under which

some of them were distributed will require to be altered, in consequence of their having previously had other names assigned to them by the late Professor Don; but as Mr. Don's materials were very imperfect, so his descriptions were defective and inaccurate, which led Mr. Hartweg into the error of giving new names to kinds previously published. As Mr. Don's names have priority, I propose in the present instance to cancel such of Mr. Hartweg's names as require it, and to rectify Mr. Don's descriptions.

No. 1. PINUS BENTHAMIANA. Hartweg, in Hort. Soc. Journ., vol. ii. p. 189.

Leaves in threes, thickly set on the branches, dark green, and resembling those of the Pinaster, but much longer, usually 11 inches in length, very stout, rather flat, with a slight elevated rib running along their inner side. Sheaths partly persistent, nearly an inch in length on those of the young shoots, slightly shaggy, except at the extremity, where they are very ragged or torn. Seed-leaves on the young plants from seven to eight in number, and rather long. Branches rather numerous, very stout, spreading, and rather irregular, with the bark rough. Buds large, dark brown, much imbricated, and destitute of resinous matter, or nearly so. Cones, in clusters of three or four together, slightly pendulous, and quite straight, six inches in length, and two and a half broad at the widest part, which is rather below the middle; the base is unequal sided, owing to the numerous very small scales there, curving to one side, and forming a kind of hood round the base of the cone, which is quite sessile. Scales largest at the widest part of the cone, which is about one-third from the base, then diminishing gradually towards the point, which is rather blunt; those scales nearest the base are very small, particularly the first four or five rows, and are more elevated in the centre, which is terminated by a stout broad point; the larger scales are rather thin and nearly flat, $\frac{3}{4}$ of an inch broad and $\frac{1}{2}$ an inch deep, with a slightly elevated ridge across the middle of each, which is terminated in the centre by a very short stout spine, quite straight: each cone has from thirteen to fifteen rows of scales. Male flowers large, cylindrical, and in large compact clusters; each scale contains within it two seeds, which are rather below the middle size; but with wings rather more than an inch in length and half an inch in breadth.

This noble Pine, which seems to be entirely a mountain species, sometimes attains the height of 200 feet, with a stem 28 feet in circumference. Mr. Hartweg first met with it on the



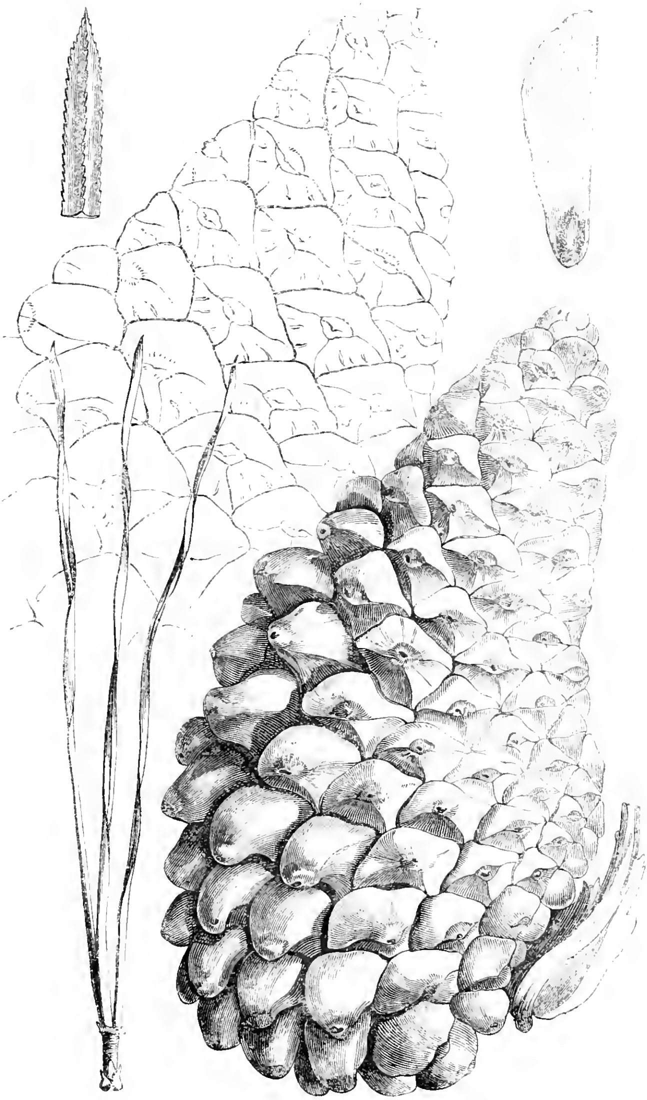
[Pinus Benthamiana.]

mountains of Santa Cruz, a coast range running due north across the bay from Monterey, and distant by water about 25 miles, although 60 miles by land; afterwards he found it in the Sacramento country, growing upon the ridge generally termed by emigrants from the United States, the Californian Mountains. Mr. Hartweg says, "after crossing the Chuba River you pass the prairie, and enter the mountains near Bear Creek, where you have to pass through an interminable wood of Pinus Sabiniana; and in ascending the gradual acclivity of the mountain you lose the region of Pinus Sabiniana and enter that of Pinus Benthamiana, which seems to be characteristic of the upper region." Some trees of this noble Pine attain an enormous size; the largest which Mr. Hartweg measured in this locality was 28 feet in circumference and 220 feet in height. It generally grows in masses or intermixed with a few solitary Pinus Lambertiana, which is of equal dimensions in these regions. The lofty mountains surrounding Bear Valley are also well wooded by Pinus Benthamiana.

It was named by Mr. Hartweg in compliment to George Bentham, Esq., late Secretary to the Society. There is little doubt but it will prove quite hardy, and a very valuable timber in England.

No. 2. PINUS RADIATA. *D. Don, in the Linnean Transactions*, vol. xvii. p. 442; *and Lambert's Pinus*, vol. iii. t. 80. SYN. *Pinus insignis, variety with large Cones*, Hartweg, Journal of the Hort. Soc., vol. iii. p. 226.

Leaves in threes, very slender, twisted, dark green, thickly set on the branches, and from $3\frac{1}{2}$ to 4 inches in length upon the wild specimens. Sheaths short, smooth, one-fourth of an inch in length on the young leaves, very much shorter on the older ones, and only partially persistent. Seed-leaves on the young plants from seven to eight in number, rather long and slender. Branches compact, numerous, rather regular and slender, particularly the lateral ones. Bark, light brown and rather smooth. Buds small, numerous, imbricated, and full of resinous matter. Cones, in clusters three or four together, rather conical, very hard, slightly incurved, pendulous, and of a glossy light brown colour, 6 inches long, $3\frac{1}{2}$ broad near the base, which is uneven as well as the sides, the outer side being much the longest. Scales radiant, largest at the external base and down three parts of the outer side of the cone, deeply divided, much elevated, and prolonged into a blunt-pointed nipple, $\frac{1}{2}$ an inch in length and $\frac{3}{4}$ of an inch broad—those scales nearest the base being bent backwards; the others more or less



[Pinus radiata.]

convex, widest at the base, bluntly conical, slightly angular, and terminated by a blunt point; the scales on the inner side of the cone and for four or five rows round the point are very much smaller, quadrangular, slightly elevated, with their points quite flat or slightly depressed. Each cone contains from fourteen to sixteen rows of scales, within each of which are two small nearly black seeds, with a very rough shell and wings 1 inch long and $\frac{3}{8}$ of an inch broad.

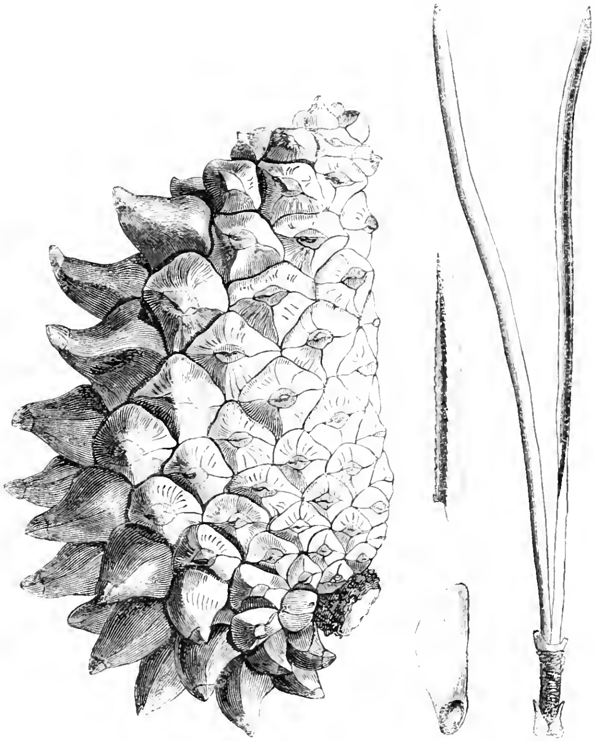
This beautiful pine resembles Pinus insignis in some respects, but differs very much in foliage and cones; the leaves of P. insignis are longer and stouter than those of Pinus radiata on the wild specimens, while the cones of P. radiata are nearly three times the size of those of P. insignis, with the scales very much more elevated. It was first discovered by the late Dr. Coulter in Upper California, in lat. 36°, near the level of the sea, and almost close to the beach, growing singly, and attaining the height of 100 feet, with a straight stem feathered to the ground with branches. He says it affords excellent timber, which is very tough and admirably adapted for boat building, for which purpose it is much used at Monterey. Mr. Hartweg met with it on the descent towards the sea on the mountains of San Antonio, 60 leagues south of Monterey, forming a small wood extending along the beach, where the dark grass green of its foliage formed a great contrast with the parched up vegetation around it at the time.

It will be as hardy as Pinus insignis, and well adapted for planting near the sea coast.

No. 3. Pinus muricata. *D. Don, in the Linnean Transactions*, vol. xvii. p. 441. *Lambert's Pinus*, vol. iii. t. 84. Syn. *Pinus Edgariana*, Hartweg, in Journal of the Hort. Soc., vol. iii. p. 217.

Leaves in twos, not very thickly set on the branches, from $3\frac{1}{2}$ to 4 inches in length on the wild specimens, very stiff, rather broad, blunt pointed, hollow on the inner side, round on the outer, and of a dull green colour. Sheaths very short, smooth, not more than $\frac{1}{2}$ an inch in length on the young leaves, and only slightly persistent on the older ones. Seed-leaves on the young plants in fives and rather short. Branches not very numerous, but tolerably stout. Buds below the middle size, imbricated, much pointed, and destitute of resinous matter. Cones in clusters of from four to seven, reddish brown when young, but changing to a gray or ash colour when old, pendulous and nearly straight or very slightly incurved on the side next the branch, 3 inches in length and $1\frac{1}{2}$ inch broad near the base,

which is the widest part, and tapering to rather a blunt point; the base is slightly uneven, and the cone sessile or nearly so. Scales largest on the outer side of the cone, particularly those towards the base; they are conical, nearly straight or slightly bent backwards near the base, much elongated, pointed, and ½ an inch in length; the scales on the inner side of the cone and at the point are much the smallest, quadrangular, and nearly flat,



[Pinus muricata.]

except those near the point, which are rather more elevated than the others, with a slight ridge running across their middle, terminated by a short, straight, broad prickle in the centre: each cone contains from nine to ten rows of scales, within each of which are two very small dark-brown seeds, with wings ½ an inch long.

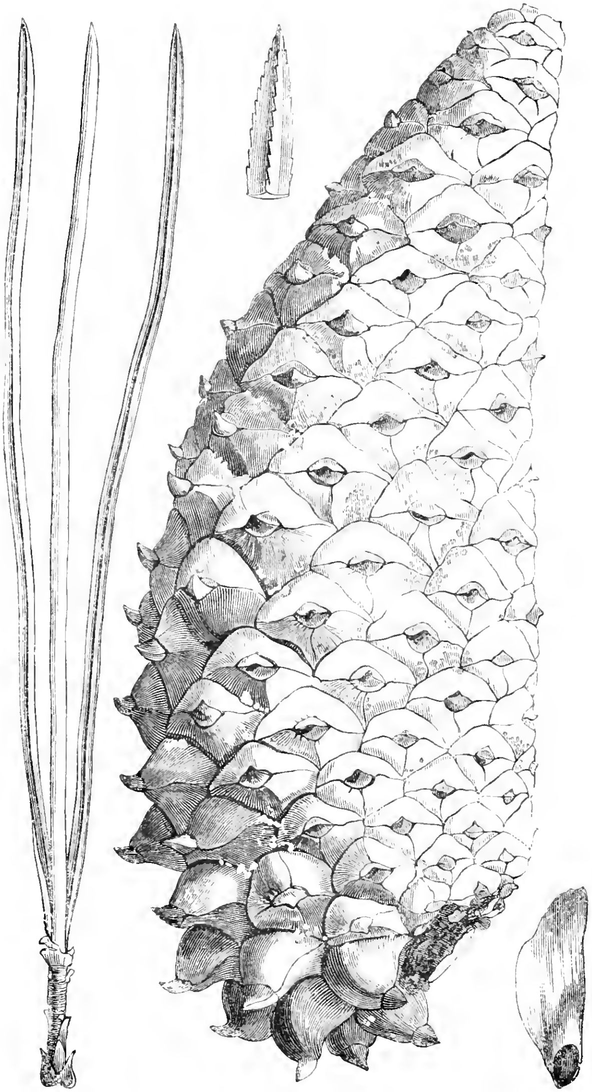
This very distinct pine was first discovered by Dr. Coulter at

San Luis Obispo, in Upper California, to the south of Monterey, in lat. 35°, at an elevation of 3000 feet, and within ten miles of the sea shore. It grows straight, but rather stunted, seldom exceeding 40 feet in height. Mr. Hartweg found it growing on the western declivity of the mountains near Monterey, and within two miles of the sea shore, attaining a height of from 20 to 30 feet, and with a trunk 12 inches in diameter. In this locality it was confined to a small wood ½ a mile square, and intermixed with and surrounded by Pinus insignis. Mr. Hartweg again met with it a considerable distance to the south of Monterey, on the ascent to the Mission of La Purissima, where the monotony of the bare hills was only relieved by a small forest of it; the trees, however, not attaining a larger size than those found growing near Monterey.

This pine Mr. Hartweg supposed to be new, and accordingly gave it the name of Pinus Edgariana; but, as it had previously been named and described by Professor Don in the Linnean Transactions, as above quoted, I am obliged to cancel Mr. Hartweg's name. It is the "Obispo," or Bishop Pine of the Californians; and no doubt will prove quite hardy.

No. 4. Pinus tuberculata. *D. Don, in the Linnean Transactions*, vol. xvii. p. 442. *Lambert's Pinus*, vol. iii. t. 85. Syn. *Pinus californica*, Hartweg, in the Journal of the Hort. Soc., vol. ii. p. 189.

Leaves in threes, thickly set on the branches, bright green, rather stiff, broad and flat, with an elevated rib running along their middle on the inner side, 4½ to 5 inches in length on the wild specimens. Sheaths short, smooth, not more than half an inch long on the young leaves, very much shorter on the older ones, and only partially persistent. Seed-leaves on the young plants from seven to eight in number, rather slender, and not very long. Branches few, stout, and rather irregular, with a roughish bark. Buds below the middle size, imbricated, and not very resinous or pointed. Cones mostly in clusters of four, but sometimes solitary or in pairs, and only produced on the main stem, of a long conical shape, 5 inches in length and 2 broad, the outer surface curved, the inner straight, widest near the base, and gradually tapering to the point, quite sessile, and uneven-sided at the base, very hard, of a light brown colour or silvery gray when old, very glossy and full of resinous matter; they stand off at nearly right angles when old, although rather pendulous when young, and remain on the trees for years without even opening or shedding their seeds. Scales largest and most developed at the external base and down three parts of the outer



[Pinus tuberculata.]

side of the cone, deeply divided, much elevated, horizontal, and rather conical, particularly those near the base, the longest of which is $\frac{3}{8}$ of an inch, terminated by a strong sharp prickle; but as they approach towards the point of the cone, they become much less elevated, more quadrangular, and blunter pointed; the scales on the inner side of the cone and round the point are very much smaller and quite flat, with a small dark brown prickle in their centre; each cone contains fifteen or sixteen rows of scales, within each of which are two very small seeds, with wings $\frac{3}{4}$ of an inch in length.

This pine was first discovered by Dr. Coulter to the south of Monterey, in lat. 36°, near the level of the sea, and growing almost close to the beach, intermixed with Pinus radiata. Mr. Hartweg found it growing on the Santa Cruz mountains, 60 miles to the north of Monterey by land. It is a tree of slow growth, and seldom attains more than 25 or 30 feet in height, with a trunk 8 or 10 inches in diameter. As hardy as Pinus insignis.

NEW PLANTS, ETC., FROM THE SOCIETY'S GARDEN.

16. Wistaria Sinensis: *alba.*

Mr. Fortune sent this from China.

According to Siebold the Chinese have many varieties of the Wistaria (or Glycine) Sinensis. Of these a pure white one has flowered in the Garden. It differs in no other respect from the lilac kind, and is much less handsome; but when plentiful it may produce a pretty effect by being inarched upon the branches of the latter.

May 28, 1849.

17. Cœlogyne asperata.*

Received in flower from T. Twisden Hodges, Esq., May 30, 1849.

This, which is much the finest of all the Cœlogynes, is a native of Borneo, and flowered in the Garden of Hemsted Park in such profusion that not fewer than 8 spikes were produced at the same time. Each of these spikes is nearly a foot long, and hanging downwards bears 12 or 14 magnificent white flowers, full 3 inches in diameter when spread open. They have a firm fleshy texture, are a pale cream colour, except the lip, which is richly marked with brownish-yellow veins, springing from a rugged bright orange central ridge. At the base of each flower grows a brown concave dry bract 1¼ inch long, which, by its dead colour, much enlivens and improves the delicate tints of the flowers themselves.

It is nearly related to the Java *C. speciosa*, but is a very much more striking species, on account of the whiteness of its noble blossoms.

May 31, 1849.

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* C. *asperata;* racemis pendulis densè multifloris subpubescentibus, bracteis subrotundo-ovatis concavis duris siccis, floribus (maximis) resupinatis, sepalis lanceolatis carinatis, petalis conformibus angustioribus ecarinatis, labelli cucullati lobis lateralibus erectis ovatis obtusis intermedio oblongo obtuso crispo: disco densè verrucoso costis 3 inæqualibus lævibus pone basin.—J. L.

18. Mimulus tricolor. *Hartweg*.*

Raised from seeds brought home by Mr. Hartweg, and said to be collected on the plains of the Sacramento valley, in California.

An annual, soft and covered with delicate glandular hairs. Leaves pale green, oblong-lanceolate, tapering to the base, here and there toothed at the edge, those near the root of the same form as the others. The flowers, which are about 2 inches long, grow singly and nearly sessile in the axils of the leaves; they have a long narrow plaited unequal calyx, beyond which projects the very slender tube of the corolla, which then widens into a funnel-shaped limb, with an oblique border cut into 5 nearly equal rounded lobes. Its general colour is bright pink, with a deep crimson spot at the base of each lobe, and a bright yellow stain along the lower lip.

It is distinguished from *Mimulus brevipes* by the uniform shape of the leaves, by the nearly sessile flowers with a long, narrow, by no means ovate, calyx, and by the slender exserted tube of the corolla.

As far as its cultivation is understood, it appears as if it would be best to treat it as a half-hardy annual.

It is a delicate growing plant, with very neat party-coloured flowers, well repaying any care required for its cultivation.

June 2, 1849.

19. Nuttallia cerasiformis. *Torrey and Gray, in the Botany of Beechey's Voyage*, p. 336, t. 82.

Received from Mr. Hartweg in January 1848, from California, said to be a deciduous shrub, 2 feet high, from the woods near Monterey.

A shrub, with a very thin half-transparent smooth deciduous foliage. The leaves are obovate-lanceolate, or oblong, perfectly smooth, pale-green, rather glaucous beneath. From the base of the young shoots, opposite one of the earliest leaves, springs a nodding raceme of greenish-white flowers, furnished with broad, reflexed, thin, very pale-green bracts. There are five petals, which soon fall off, and fifteen stamens inserted on the calyx in a double row. The aspect of the plant is something that of a bird-cherry, but its fruit is said to consist of from one to five leathery drupes, which finally dry up and split.

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* M. *tricolor*; annua, erecta, pubescens, foliis oblongo-lanceolatis subdentatis vix inæqualibus, floribus subsessilibus, calyce angustissimo plicato dentibus inæqualibus, corollæ tubo gracili exserto in limbum obliquum subæqualiter quinquefidum rotundatum dilatato.—J. L.

A hardy, dwarf, neat-looking shrub; increased by suckers or seeds, and growing freely in any good garden-soil. It flowers before the leaves are produced, in February and March.

April 4, 1849.

20. Epidendrum fragrans, *Swartz;* var. megalanthum.

Presented to the Society by G. U. Skinner, Esq., in July, 1848, and said to be from Guatemala.

In all parts of tropical America this epiphyte seems common, and many varieties are known to cultivators; but they are generally too trifling to merit special names. In this instance, however, a form has been received which is most remarkable

for its unusual dimensions. The flowers are full 4 inches in diameter, of a pale clear greenish-white, and the lip is vividly marked by clean stripes of very rich crimson. It is quite a giant of its kind, for the pseudo-bulbs and leaves, taken together, are sometimes 18 inches long.

It is best grown in the coolest part of the orchid-house, potted in fibry peat, with half-decayed leaves, and liberally supplied with moisture during the growing season. It is a very desirable plant, with large fragrant flowers.

May 21, 1849.

21. Cortusa Matthioli. *Linnæus.*

Seeds received from the North of India from Capt. Munro.

Among many highly interesting plants raised from the seeds sent to the Society by this officer was a Cortusa, which upon flowering proved not to be distinguishable, even as a variety, from the charming European alpine form.

The species having also been found in the birch-woods of the Punjaub, near a fort called by Jacquemont "Choupienne," must now be considered to extend over all the lofty mountain-chains lying between Savoy and the Chinese frontier; an unusually wide distribution for such a plant.

A hardy perennial, requiring a rather dry situation, and well suited for rock-work, growing freely in any good loamy soil which is not over retentive of moisture. It is increased by dividing the roots when the plants are in a state of rest. It is a well-known neat little alpine species, deserving a place in any select collection.

May 10, 1849.

22. Pæonia Moutan: *versicolor.*

Received from Mr. Fortune in April, 1846, from the north of China, and said to be the "Tee-lok," a greenish-white kind.

Flowers large, semi-double, or probably quite double, with large broad petals, very irregularly arranged and cut on the edges, deep purple near the base, fading to a rosy lilac near the outsides. Foliage narrow and pointed, like that of the old P. papaveracea.

Requires the same kind of treatment as the other kinds of Tree-pæony. Very handsome, showy, and distinct.

May 18, 1849.

23. Pæonia Moutan: *atrosanguinea.*

Received from Mr. Fortune in May, 1846, marked "dark-purple," from Hong Kong, and from Shanghae as "very dark, nearly black."

Flowers, a good double, dark crimson; outer petals large and mostly entire; inner ones much smaller and lobed; foliage like that of the old P. papaveracea, but rather narrow and more pointed.

This is a very handsome, deep-blood coloured variety, the darkest in colour of all the Tree-pæonies yet in cultivation.

May 18, 1849.

24. Ophrys vespifera. *Willdenow, Species Plantarum*, 4, 65; *Lindl., Gen. et Sp. Orch.*, p. 372.

Purchased at the sale of the late Dean of Manchester's plants.

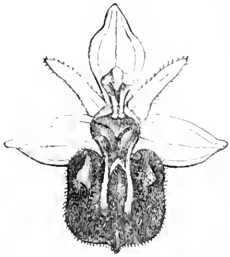
In this and the following species we have gained two of those rare and curious kinds of terrestrial Orchids in which the lovers of singular forms have always been much interested. Their foliage has nothing that deserves special mention, but their flowers are sufficiently remarkable.

The Wasp Ophrys was found by its late lamented possessor in Corfu, and was brought in a living state to England. It has a yellow lip, perfectly free from hairiness, but marked with brown streaks and spots, so as to resemble the body of the insect after which it is named; especially when the sepals and petals are curved down upon its base, as is the case in its natural state. The annexed cut shows the flower spread flat.

The species is so rare that it can scarcely be said to exist in the herbaria of this country; the plant called *O. vespifera* by some, and which is usually mistaken for it, being quite different, with large deep yellow flowers, having a broad stripe of crimson wool. That plant, which is as common in the south of Europe as this is rare, is the Ophrys lutea of Cavanilles and other botanists.

Like other species of the genus, the true Ophrys vespifera varies a little in the form of the lip, which is sometimes roundish and sometimes obovate; but it appears always to have the middle lobe emarginate.

25. OPHRYS MAMMOSA. *Desfontaines, in the Annales du Muséum*, vol. 10, t. 15.



In the same collection as furnished the rarity just described was obtained another Ophrys, which is apparently the obscure plant hitherto only known from a drawing by Aubriet, in the Museum of Natural History of Paris, and called *mammosa* because of its having two prominent spaces on the side of its lip. Here the flowers are much larger than in the last: the petals have a rosy tinge, and form, with the green sepals, a flat circle; the lip is a deep chocolate brown, downy, nearly square in its outline, with a pair of parallel bluish lines passing down the middle.

It is a very curious thing, nearly allied to *O. ferrum equinum* (the Horse-shoe Ophrys); a species that, however, wants the two mammæ on the lip, which moreover is more lozenge-shaped and irregularly wavy on its edge.

Both these plants are the subject of an experiment now in progress in the cultivation of terrestrial Orchids, the result of which will be communicated to the Society hereafter.

July 5, 1848.

ORIGINAL COMMUNICATIONS.

XXVI.—*Contributions to a History of the Relation between Climate and Vegetation in various parts of the Globe.*

No. 10.—*The Vegetation of the Indian Archipelago.* By Dr. C. G. C. Reinwardt, Professor of Chemistry, Botany, and Natural History at the University of Leyden.

(Freely translated and abridged from the German.)

THAT nothing determines the natural character of a country so well as the vegetation which it produces, is an incontrovertible fact. In it alone are the purely distinct and unadulterated features of the country impressed. This, however, cannot be said of all other natural productions. The soil and subsoil, the minerals and mountains, are little dependent on any particular country. They may be the same in the most different parts of the globe; and experience teaches us that this is really the case. As little are animals fit to characterise climate; they are not instantly met with and everywhere; a great many fly from mankind and hide themselves. The residence, the departure, the going to and fro of the animals from one country to another, and their return, is influenced by a great variety of causes. The pliancy of their nature accommodates itself to circumstances; and a number of influences produces in them at last a certain inconstancy and loss of character. There is not a country, therefore, which derives one single distinct and conspicuous feature from its animals. The plants, on the contrary, are fixed in their localities; they are a purer production of the country and climate; no foreign influence has operated upon them; they receive their whole existence from the ground in which they grow, and from the surrounding objects. The influence of these objects shows itself in unvarying features of vegetation, and in their unchangeable renewal.

It is to be understood that these remarks can only be applied to a country which is still in its primitive natural state. Europe can hardly furnish an example of it. Man is found everywhere; in Europe there is not a place in which he has not given signs of his existence and its influence. He has almost everywhere changed the surface of the earth, and thus deprived it of its original character. Corn-fields and meadows supply the places of natural forests; in other parts they have been destroyed by wars and conflagrations. The rivers in consequence have lost their origin and springs; many are dried up, and others have had their course altered. The ground is broken up, and con-

stantly changed by the plough, the axe, or the miner's blasts. Foreign vegetation is mixed with indigenous; and plants which the country formerly produced are destroyed, or have vanished. We must go then to other parts of the world—to countries which still retain their original aspect, and which have not yet been under the influence of mankind—in order to establish the truth of what has been said above.

I have been so fortunate as to see such a country, the greatest part of which is still in its original state, such as it was when it first went forth from the womb of the creation—where every object displays its unaltered character—where, above all things, the vegetable kingdom presents extraordinary vigour and a high degree of the most varied development; from which we may infer that the most favourable circumstances have combined to produce the most luxuriant vegetation.

While still in the distance, on arriving from the Indian Ocean in the Straits of Sunda, and on passing the island of Java, the sensation of joy at the near termination of a long sea voyage is greatly heightened by the view of thickly-wooded land, which presents itself on all sides, and particularly on the coast of Java. Behind the lofty summits of palms, which appear at and near the shore, a wide extent of plain shows itself rising gradually from the sea, and upon which are spread dark green groups of timber trees; and farther on the horizon is bounded by the dark green forests which cover the lofty mountains. These views are the more surprising, when the traveller calls to mind the sparing vegetation on the Canaries and the Cape-de-Verds, and on the bare flat table-mountains of Africa. Once ashore, the muddy banks are soon left behind; although even there occur singularly strange figures, which captivate the stranger's attention. Rapidly proceeding through the palisade-like trunks of the Mangroves, and the fans of Nipa Palms which hide their stems in mud, one can only admire with a glance the gorgeous flowers of Barringtonias and Sonneratias, and the balls of fruit hanging thickly from the long-leaved Screw-pines. Hence the road leads for a long way through inhabited and cultivated plains. Farther on the ground gradually rises; but signs of industry are far from disappearing. Rice-fields surround the bases of the mountains; their terraced squares, resembling the steps of a staircase, are packed one above the other, and form innumerable cascades; after which succeeds the dark green shining foliage of unknown bushes, which join the upper forest, and form a slight transition from the cultivated ground to that where Nature is found in all her glory.

Before, however, entering the primitive forests, let us throw back a glance upon the long slopes, and convince ourselves that there is no bare ground to be seen—that from our elevated posi-

tion down to the very shore scarcely a spot exists which is not covered with vegetation, except the red lines of roads and footpaths, and the foaming waters of the rivers as they rush downwards to the ocean. Here and there places are to be seen which, formerly inhabited and cultivated, are now left to themselves. Even these spots have been covered with vegetation; which, however, has this peculiarity, that it seems neither to belong to the cultivated races nor to those which are indigenous to the soil. Nature has here recovered her dominion only in part, and looks as if unwilling to receive back the soil which was once her own. High thickets of unvaried rush-like plants, belonging to the race of sugar-canes, upon whose slender stems hang fluttering tufts of foliage of a snowy whiteness, occupy the place that once belonged to the natural forest or the corn-field, and mark the neglected soil. These places are monuments of the history of the country, and companions of the fate which the inhabitants themselves have suffered.

How different is everything when the traveller reaches the primitive mountain forests, far away from human habitation, and never or very rarely visited by man! Here the vegetable kingdom shows itself in its original state, and for the first time enables us to understand what really is the vigour of plants undisturbed in their growth in a tropical climate, and supported by a combination of the most favourable conditions. It is not possible for me to convey an idea of the impression which the aspect of the scene produced on me. To give a faithful account of what caused this impression, I should be obliged to detail the effect of every single object. And yet the impression was not so much caused by any particular object, as by their marvellous combination in the place where Nature fixed them. I must therefore confine myself to a representation of general features, although it will give but a feeble idea of the peculiar and magnificent vegetation of India.

What is it that stamps with characteristic marks this exuberant growth? Is it the enormous quantity and extent of the vegetation? The plains of the island of Java are more than 2300 square miles in extent, and they are considerably enlarged by the mountains, which are from 10,000 to 12,000 feet above the level of the sea. These mountains are almost everywhere covered with dense forests, which may well be called lofty, for there is scarcely a tree in them less than 100 feet in height. In some places they are so dense that the traveller can scarcely move a foot without having previously made a pathway with the axe through the climbing plants and herbage which everywhere occupy the spaces between the stems of the trees; where the ground is insufficient for the support of the luxuriant vege-

tation, where plants grow *pêle-mêle* one upon the other, where thousands of parasites are perpetually contending for the elaborated sap of the patient trees, and developing on every side in endless forms, where climbers and twiners are interwoven with every branch. Not a sunbeam can pierce this shade.

If we look for individual magnitude, this too will not fail to create astonishment: the very grasses and bamboos grow into hollow trees, which are large enough to be made into vats, casks, water-pipes, and timber; the long, straight stems of Cyatheas and other ferns rise into the air like tall masts in a pine forest; the twining plants, the canes (Calami), Uranias, and Nancleas grow to the size of an arm or leg, and, like serpents, surround the trees, and sportively impress deep furrows in their trunks. Here nothing occurs to check the almost incessant growth of vegetation; forms, which we only know as summer flowers, in these forests live and grow continually for centuries. Many a tree, like the African Adansonia, produces stems prodigious for their thickness, height, and age. Immensely large cotton trees (Bombax), and a hundred others, astonish us by their magnitude and prodigious wide-spreading branches. In vain do we search in the tops of the trees for the extremities of the climbing plants; they throw themselves from tree to tree, or, casting off all support, return to the ground, and there renewing their growth, soon dart over to the tops of other trees. In this way we see many a trunk connected with its neighbours by the flexible arms of the Rattan (Calamus), not uncommonly several hundred feet long. Invisible and unknown powers are at work, in one direction driving onward the general mass of vegetation, and in another enlarging and multiplying individuals. One portion of the rushing sap rolls onward, thickening and forming new parts, rising upwards or following a branched direction; another part distends the swelling bark, pierces the branches, and stiffens in long rods, which either issue forth along the main stems which they surround at acute angles like so many stays, or rapidly descend from the upper branches, strike fresh roots into the soil, and then give birth to other stems. In like manner a thicket is often formed from a single tree, and by their union the spaces in the forests are incessantly filled up. I saw on the island of Semao a large forest, the trees of which all originated from one fig-tree (Ficus Benjamina), and which still retained their connection with each other.

Not alone do great masses and vast size mark this luxuriant vegetation, but endless diversity in size and form gives it its predominant character. In India we have nothing of the everlasting monotony of the moors and heaths in the north of Europe; or of the scrubby bushes that clothe the salt plains of Siberia and Tar-

tary, where a wretched sameness of form constantly attends the traveller's dreary progress. Here abound numerous families and forms of plants, of which our indigenous vegetation affords no example. A single Indian island frequently possesses almost every variety of vegetation; the few which are not to be found in the fertile soil of Java are merely such as require a dry sterile soil, like succulents and the spiny forms of Africa, which live mainly upon air and dew, and consequently can exist in a dry sand. A single tree frequently displays an entire flower-garden, raised upon a single stem into the air.

It is more especially to the different elevations of the land in the Indian islands, and to the change of temperature which is connected with it, as well as to the nature of the mountains themselves, that so great a variety of forms is owing. There is perhaps no country in the world in which, upon so limited a space, the floras of the most distant regions are thus assembled. A few hours are often sufficient to see them all in their natural localities, or even to experience a change of climate from the heats of the Line to the rigour of the Polar regions. Nothing can be more singular than the peculiar vegetation of the beach, where the dissimilar forms grow crowded together in amity. We there find the tall, stout, broad-leaved Calophyllum standing among the branched Ægiceras, while the straight and slender stems of lofty palms dart upwards from among impenetrable thickets, where entangled mangroves (Rhizophoras), grey Tournefortias and Avicennias, varnished Dodoneas and Sonneratias are all associated with the long drumsticks of Bruguieras and the spherical fruits of the Screw-pine (Pandanus). Thence, as the plain rises gradually, the cocoa-nut trees, fan-palms, and others of that race become scarcer, and show how unwilling they are to leave the shore. Passing through an endless variety of shrubs on the foreground of low hills, the traveller soon reaches the crowd of trees which cover the base of the mountains; and which, because of the predominating species found there, may be called Fig forests. From what Professor Blume and myself have observed, the number of figs in these forests may belong to at least a hundred distinct species, of which the greater part is confined to the lower region. Their general character is to give a closeness and darkness to the air by their density and the loftiness of their trunks. The damp atmosphere by which they are surrounded, their immensely thick stems, and spreading branches, their singularly rapid vegetation, and the soft spongy substance of their wood, afford pasturage to an infinite variety of parasites and twining plants, which derive their nourishment partly from the trees, and partly from the deep loose moist decayed vegetable soil. Numerous monkeys leap screaming over the higher

branches, and flocks of gay-coloured birds enliven the scene. Only a few species of fig, chiefly of the yellow-leaved low-growing kinds, rise high up the mountains, diminishing in size as they ascend. But among the great mass of the species, innumerable other forms are mingled. Great numbers of Meliads, Ebenads, Sterculias, Soap-berries, Caryotas, and Artocarpads resemble each other in the vigorous growth, height, and thickness of their stems, in the intervals between which stand crowds of herbaceous plants and shrubs, such as Ardisias, Grewias, Elæocarps, Phyllanths, Saururi, Ruellias, Justicias, Dimocarps, Salanums, Scitamineous plants, Arads, and Orchids; while the great parasitical kinds of Aralia, Vines, Uranias, Peppers, Cyrtandras, Pothoses, and Loranths weave the whole together.

At a higher elevation, but within narrower limits, stands the beautiful and conspicuous Rasamala forest, which is more especially remarkable in the western mountains of Java. It derives its name from an indigenous tree which seems to belong to the genus Liquidambar, and furnishes a Storax. Noronha described it under the name of Altingia excelsa. Its beautiful tall, straight, whitish trunk, less overgrown than those of the fig-trees, and with a more regular head of light green foliage, marks the wooded region, which receives its character from this useful tree. Thick thorny bushes, many kinds of Calamus, and a great variety of Cinchonaceous plants, remarkable for their peculiar and powerful exhalations, which are perceived at a distance, form the copsewood of this aromatic forest.

At an elevation of 3000 feet we leave the Rasamala forest. Here the Coniferous tribe appears in all its beauty in the Kimarak, which is not only the most beautiful of Podocarps, but is one of the finest trees which the southern hemisphere produces, rising majestically to a considerable height, with its straight stem towering above the other forest trees, which are now beginning to appear of smaller stature. Its neighbour and relative the Dammar Pine rises near it, requiring similar physical conditions under which to develope. These trees do not, however, stand so bare and isolated as our own fir trees; on the contrary, they allow other plants to grow near them, the spaces between being occupied by beautiful Rhododendrons, and many varieties of Fern. The singular Pitcher-plant here hangs down from the lofty branches, and the broad and elegantly-divided fronds of a beautiful Fern, the Dipteris, rise upon their slender stems. This elevated situation is more particularly characterized by the different kinds of Laurels, which here predominate. Java is especially rich in Laurels, as well as in Figs; these, with some Eugenias and other Myrtaceous plants, with a very large Gardenia, perpetually in flower, cover everywhere the

highest spots in the mountains of India, associated with tall Melastomas, Rhododendrons, Magnolias, filling the air with their fragrant perfume, and several sorts of Oak. Intermixed with these Orchids constantly prevail, and in great variety.

It is only where the forest of Laurels ceases, and the summit of the mountains becomes narrower and can no longer retain a covering of vegetable mould, when the air becomes more rarefied and colder, at an elevation of more than 7000 feet, that the appearance of the forest trees changes; they then become dwarfed and crooked, and their leaves become smaller, stiffer, and harder; long-leaved Usneas hang from the mossy branches, and every thing brings to recollection the colder regions of the Alps. Certain kinds of Heathworts (Ericaceæ), such as Andromedas, Vacciniums, Clethras, and low-growing Rhododendrons, together with a species of Gale (Myrica), cover the highest tops. Other tribes, never found in the lower parts of India—and which we imagine to be, if not indigenous exclusively with us, at least altogether ultratropical—surprise us on these elevations, and bring to memory our native land. Here grow Valerians, Ranunculuses, Daisies, Hypericums, Honeysuckles, Gnaphaliums, Swertias, and a pretty little Gentian, rooting in the dry ashes of the lava; all these grow in high situations, but under the Line, or near it. Not less striking are the humid elevated valleys and the enclosed fields lying between the summits of these volcanic mountains. In such places may be found Violets, Elders, Mints, Potentillas, Centaureas, Spiræas, Sorrels; Isopyrums, and even Carexes make their appearance. It is, however, to be noticed, that all these forms are peculiar to their own soil, so that none can be identified with ours, unless it be a few Cryptogamic plants which are thoroughly European. The Turfmoss (Sphagnum), on a cushion of which one treads in these Alpine forests, does not indicate the slightest difference.

These details show how much the Flora of the Indian Islands is distinguished by its richness, luxuriance, variety, and novelty. It is an archipelago whose Flora will long remain an inexhaustible source of important discoveries; and we may assert without hesitation that, in this respect, there is hardly another part of the earth, or another group of tropical islands of similar extent, which can compete with it. Africa and New Holland are so behind in this respect that I need not bring them into comparison. America only approaches it; yet on that continent a luxuriant vegetation by no means occurs with the same uniformity; in America the summits of the lifeless granitic mountains are quite naked; barren quartz-sand, which is hardly known in the Indian Islands, is there abundant. In the low-lands of America, often overflowed by mighty streams, or

in the bogs and marshes which are left behind, a most luxuriant vegetation is certainly to be found. In America, however, there is no harmony of masses, nor that equal distribution of the powers which produce a lasting fruitfulness; neither is there the pure ethereal atmosphere which we meet with in the mountain-forests of Java.

So remarkable a difference leads naturally to an inquiry into the causes which produce such a universal and almost unexampled exuberance of vegetation. I cannot venture myself just now to enter into an explanation of all which might throw light upon the subject; I can only touch upon a few principal points to which my observations and experience clearly point. These show that besides the generally favourable influence of the tropics and mere elevation, there is a marked difference of ground and a peculiar nature of the soil, to which the great force of vegetation must be attributed. It is well known that all these islands have been formed by former volcanic convulsions; these, in comparison with what have occurred in other parts of the earth, were evidently of a later origin, and the subterraneous fires may still be in action; at all events, their influence, whether earlier or later, manifests itself almost everywhere. This explains why volcanic rocks, particularly of Trachyte and Dolerite, make their appearance everywhere, and form the great bulk of the ground and mountains, with the exception of the limestone, which is always produced in the sea. Nowhere other or older rocks appear to be produced by the precipitation of water. It is, therefore, evident that the ground—that soil which excites our admiration by its inexhaustible fertility—can have only been produced by different kinds of volcanic rocks. The composition of these rocks is well known, as also the influence of the weather upon them; but it is perhaps not so well known how generally and constantly and quickly the decomposition of these rocks and their transformation to soil frequently take place, notwithstanding their hardness. The combined influence of atmospheric air and water, and constant changes from heat to cold, from dryness to moisture, upon a rock formed by sedimentary deposit, and therefore highly susceptible of all external influences, particularly of those of moisture—their granular junctions, the openings and clefts in them,—all these things facilitate the influence of every active agency. Water, sinking down into such rocks, causes frequent slips; heavy rains, swollen torrents, often tear the loose parts asunder, sweep them away in their current, and, by an incessant wearing down, gradually render them smaller and smaller. Volcanic action is not less active in the process of destruction; powerful liquids, confined and elastic gases, sulphureous vapours, acids, salts, even

vegetable mould, and the plants themselves, act continually upon the hardest rock. Such circumstances taken together, in some measure account for the constant change which takes place of rocks into soil. They are, however, not sufficient to explain all the phenomena. This, at least, is certain, that the disintegration of rocks does take place, and is an everlasting source of fertility.

The fertility of soils in the neighbourhood of volcanos has been long known, but perhaps nowhere shows itself in such profusion as in the Indian islands. This arises from the intrinsic nature of the soil, which is a very peculiar substance, and not to be compared to any of the soils of our fields. All the ingredients are so intimately incorporated that they cannot be divided by mechanical means, like other soils, nor is it possible to produce them by any artificial method. Many excellent peculiarities, which we should in vain desire our native soil to possess, distinguish that of the Indian Archipelago from all others. The size and coherence of its particles are in such proportions that they neither fly away like sand nor become baked like bricks by the influence of a strong heat, nor does it split or crack, by which often the tender roots are destroyed. It remains always open and loose to receive the influence of the atmosphere; it sucks up water readily, retains it sufficiently, and is not dried up quickly; moreover, it has these two capital properties, which are the chief causes of its fertility: in the first place, its particles are in a state of constant change, and are highly susceptible of external influences, by which the alternate action between itself and other matters is constantly maintained. In the second place, it has the power of retaining vegetable matter, and all other substances from which the plants derive their nourishment, so that there is no exhausting its fertility. It requires no manure; the elevated forests supply it always with sufficient nutritious matter. An Indian hardly knows what manure means; the plough and irrigation are sufficient to maintain that beneficial intermixture of the atmosphere and the soil which supplies the latter with renewed power. In this manner he has maintained for centuries in the same natural soil his rich rice-fields; the soil alone gives the husbandman all the returns he can desire. In addition to all these circumstances, we must take into account the other favourable conditions of a tropical climate. How much must the power of the soil be increased by the constant warmth of an atmosphere which penetrates it, dissolving and rarefying all its nutritive qualities, and rendering it sensible to every influence; where it is moistened by the vapours from a surrounding ocean, and is always supplied with fresh soil and fertile substances from the copious rains in the mountain

forests! In addition, there is the daily revolution of the globe, the change from day to night, and the consequent change of temperature from warm to cold, which is more felt in the tropics than beyond them. The more the vertical rays of the sun heat and open the ground by day, the more it becomes susceptible of all the ingredients of the atmosphere, which, with the night breezes, flows over the rarefied air of the sea, descending upon the land, and producing a sort of respiration in the soil, every inhalation and exhalation of which tends to supply it with fresh stimulating matters. To this is owing the beneficial influence of the daily land-air and sea-breezes, which are more prevalent near the meridian than elsewhere, and which are not more wholesome to the animal than beneficial to the vegetable kingdom.

Finally, as riches continually multiply themselves more and more, so in like manner have a luxuriant vegetation and great fertility a constant tendency to accumulate. Astonishingly great as is the quantity of vegetable matter which is incessantly produced and consumed in the country now referred to, still greater is that which continually arises from the death of animals, which raise the ground, mix with the soil, and render it still more capable of producing an ever increasing luxuriance. The dead mass never rests: decomposition on the one hand, and new life on the other, attack it and bring about a new circle of transformation and motion.

XXVII.—*Chinese Cultivation. The Tchou-ma, or Chinese Flax.* Translated from the Chinese by M. Stanislas Julien, and retranslated from the French.

[The following extract possesses much interest in addition to what it derives from its Chinese origin, in consequence of its being not impossible that attempts may be made to introduce the cultivation of Tchou-ma into Great Britain. Its delicate fibre forms the flax from which the finest of the Chinese linen fabrics are manufactured.]

Amongst the products of Chinese industry which were exhibited a few years ago in the Rue St. Laurent were some pieces of a fine silky tissue, called by the Chinese *hia-pou* or summer cloth, and made of the fibres of the plant called by botanists *Urtica nivea.* Some seeds of this plant were sent from Canton in 1843 by M. Hébert, but they never arrived, and I was at that time told that they would probably not grow in our climate. I am sorry that I was not then able to translate the papers which

I now lay before the public. After reading the following account of the cultivation of the plant in question, it will be readily seen, by those who are competent judges of the matter, that the supposed want of success was owing to nothing but ignorance of the care and delicate treatment which are necessary for the culture of the plant now before us. The way in which its valuable threads are peeled, steeped, and bleached, is, as will be seen, described by the Chinese authors with a precision and minuteness amply sufficient to enable any person to pursue this new branch of industry in our own country. Until a new supply of seeds is received from China, roots or young plants of the Urtica nivea may be obtained from the Garden of Plants, and be propagated in the way mentioned below, and thus may a substance be given to our manufacturers which will, in their hands, be made into a tissue as soft as silk, and as fine as but stronger and tougher than the best French cambric.

Cultivation of the Tchou-ma (*Urtica nivea*).

(Imperial Treatise of Chinese Agriculture, lib. lxxviii. fol. 3.)

For the purpose of sowing the *tchou-ma* in the 3rd or 4th month, a light sandy soil is preferred. The seeds are sown in a garden, or where there is no garden, in a piece of ground near a river or a well. The ground is dug once or twice, then beds 1 foot broad and 4 feet long are made; and after that the earth is again dug. The ground is then pressed down either with the foot or the back of a spade; when it is a little firm, its surface is raked smooth. The next night the beds are watered, and on the following morning the earth is loosened with a small-toothed rake, and then again levelled.

After that half a *ching* (4 pints and a half) of moist earth and a *ho* (one pint) of seeds are taken and well mixed together. One *ho* of seeds is enough for 6 or 7 beds. After having sown the seeds it is not necessary that they should be covered with earth; indeed, if that were done, they would not germinate.

The next thing to be done is to procure 4 sticks, sharp at one end, and to place them in the ground in a slanting position, 2 on one side of the bed and 2 on the opposite side; they are for the purpose of supporting a sort of little roof 2 or 3 feet high, and covered with a thin mat.

In the fifth or sixth month, when the rays of the sun are powerful, this light mat is covered with a thick layer of straw. If this precaution were not adopted, the young plants would be destroyed by the heat.

Before the seed begins to germinate, or when the young leaves first appear, the beds must not be watered. By means of a broom

dipped in water the roof of matting is wetted so as to keep the ground underneath moist. At night the roof is removed in order that the young plants may catch the dew.

As soon as the first leaves have appeared, if parasitical plants appear they must be immediately pulled up. When the plant is an inch or two high, the roof may be laid aside. If the earth is rather dry, it must be slightly moistened to the depth of about 3 inches.

A stiffer soil is now chosen and thrown into beds to which the young plants are to be transferred. The following night the first beds, in which the young plants are, are to be watered, the next morning the new beds are to be watered also. The young plants are then dug up with a spade, care being taken to keep a small ball of earth round their roots, and are pricked out at a distance of 4 inches the one from the other. The ground is often hoed.

At the end of 3 or 5 days the earth must be watered, and again at the end of 10 days, 15 days, and 20 days.

After the 10th month the plants must be covered with a foot of fresh horse, ass, or cow dung.

Same subject.

(Extract from the General Treatise on Agriculture, intituled 'Nong-tching-tsiouen-chou.')

When the *tchou-ma* is cultivated for the first time it is raised from seed. The roots of the seedling plants give of themselves new shoots. At the end of a few years the roots cross each other and intertwine, when the stems must be separated and replanted.

At the present day it is very common, in the countries of 'An-king and Kien-ning, to disentangle the roots with a knife, and to replant them. Those who cannot procure seeds follow the plan adopted for obtaining young mulberry trees from layers.

This plan is a very quick one.

In those countries, however, where there are no roots of the *tchou-ma*, and where it is not easy to procure them from other places, the seed is had recourse to.

As soon as the young plants are a few inches high they are watered with a mixture of equal quantities of water and liquid manure. Immediately after the stems are cut the ground must be watered, and this ought to be done at night or on a cloudy day; for if the plants were watered in the sunshine, they would rust. Great care must be taken not to make use of pig's dung.

The *tchou-ma* may be planted every month; but it is necessary that *the ground be moist.*

Transplantation and Propagation of the Tchou-ma.

(Imperial Treatise on Agriculture, lib. lxxviii. fol. 5.)

When the tufts of the *tchou-ma* are strong enough the earth around is dug, and new stocks are detached and transplanted elsewhere. The principal stock then grows more vigorously. At the end of 4 or 5 years, the old stock becoming excessively strong, they are divided and replanted in other beds.

Some persons are satisfied with bending the long stems down and obtaining layers in the ordinary way.

When a bed becomes too crowded, another must be formed, and then another and another. In this way the plants may be propagated to any extent.

A stiff soil that has been well worked in autumn is chosen and manured with fine muck. In the following spring the plants are transplanted. The best time for carrying on this operation is when vegetation commences; the next best is when the new shoots appear; and the worst is when the stems have attained a considerable size.

The new plants are placed a foot and a half from each other, and when they have been well surrounded with earth they are watered.

In summer as well as in autumn advantage must be taken of the time when the earth has just been moistened by rain. The offsets can be transplanted to places near at hand, but it is essential to have a ball of earth around each plant.

Same subject.

To propagate the *tchou-ma*, portions of its roots 2 or 3 inches long are detached by a knife, and are placed by twos and threes in little trenches that are about a foot and a half from each other. The roots are then surrounded with good earth and watered; the watering is renewed three or five days afterwards. When the new stems have attained a certain height, the earth must be often hoed.

If the earth is dry it must be watered. If the plants have to be carried to a distance, their roots ought to be surrounded by the soil in which they have been growing, well enveloped in leaves of the reed. They are placed, in addition to this, in a mat folded so as to exclude them from air and light. They may then be carried without danger to a distance of many hundred miles.

The first year, when the plants are a foot high, they are gathered; they are gathered again in the second year. The fibres of the cut stems are fit for spinning.

In the tenth month of every year, before cutting the offsets which pass beyond the roots, the earth is covered with a thick layer of cow or horse dung. In the second month the manure is raked off in order to allow the new plants to come up freely. At the end of 3 years the roots become excessively strong; if part of the plants which come up in close tufts were not removed, the others would be smothered.

Gathering the Tchou-ma.

The *tchou-ma* may be gathered 3 times a-year. When the stems are cut, the little shoots springing from the root-stock should be about half an inch high. As soon as the large stems are cut, the suckers spring up with more vigour, and soon furnish a second crop. If the young shoots be too long, the large stems ought not to be cut; but the ground shoots would not become vigorous, and would be prejudicial to the development of the larger stems.

The first crop is got in towards the commencement of the fifth month; the second in the middle of the sixth, or at the beginning of the seventh month; and the third and last in the middle of the eighth or the beginning of the ninth month. The stems of the second crop grow much faster than the others, and are by far the best.

After the crop, the stocks of *tchou-ma* are covered with manure and immediately watered.

Peeling the Fibres of the Tchou-ma.

When the stems are all got in they are split longitudinally with knives of iron or of bamboo. The bark is first removed; then the lower layer (which is white, and covered with a shrivelled pellicle which comes off by itself) is scraped off with a knife. The interior fibres are then seen; they are to be removed and softened in boiling water. If the *tchou-ma* be peeled in winter, the stems must be previously steeped in tepid water in order that they may be the more easily split.

The first layer of *tchou-ma* is coarse and hard, and is only good for making common materials; the second is a little more supple and fine; the third, which is the best, is used for making extremely fine light articles.

Steeping and bleaching the Tchou-ma.

The stems are tied up in little sheaves and placed on the roof of a house, in order that they may be moistened by the dew at night, and dried again by the sun in the day.

In the course of from 5 to 7 days they become perfectly white. If the weather be cloudy or rainy the stems are placed under cover in a current of air. If they are wetted by the rain they immediately turn black.

Another author says, after peeling the fibres they are tied in skeins, arranged in a circle, and steeped for a night in a pan of water; they are then spun on a wheel. This done, they are again steeped in water containing the ashes of burnt mulberry wood.

Having taken them from the pans they are divided into packets of 5 oz. weight each; the packets are placed for a night in a tub of a mixture consisting of a cup of pure water and an equal quantity of powdered chalk to each packet.

The next day the chalk is got rid of, and the fibres are boiled in water containing straw ashes, by which process they become white and supple. Being now dried in the sun they are again boiled in pure water; they are then stirred about in more water, which finishes the cleansing process, and lastly they are dried in the sun.

This done, the fibres are joined end to end on the wheel so as to make long threads, which form the warp and the woof, and are manufactured into stuff in the usual way.

Another author says, after having spun the fibres of *tchou-ma*, they are boiled in lime water, and when cool, carefully washed in pure water. Then by means of a bamboo sieve, placed on the surface of the water, they are spread out in equal layers in order that they may be as it were half wetted below, and half dried above. As night approaches, they are taken out, strained and dried: the same process is repeated the next and following days, until the threads are perfectly white. They are then, but not before, fit for being made up.

According to another process, the *tchou-ma* is first soaked, then spun and made up, instead of being soaked after the spinning.

Other persons again take the fresh fibres, expose them at night to the dew, and in the day to the sun; then spin and weave, bleaching last of all.

Others lastly, following those who employ the plant *Ko*, cut the stems, soften the fibres in the steam of boiling water, then weave, and do not bleach at all. Fibres thus prepared give a material that is more supple and fibrous.

Mode of Gathering the best Seeds of Tchou-ma.

When seeds of *tchou-ma* are wanted for the purpose of sowing, those which are found on the main shoots are to be preferred.

In the ninth month, after the period *choang-kiang* (after the 2nd of October), the seeds are collected and dried in the sun; they are then mixed with damp sand, and put in a bamboo basket, carefully covered with straw. This precaution is needed, for if the seeds are frozen they will not grow. The seeds of the lateral shoots are not fit for sowing. Before sowing, the seeds are thrown into water, and those that sink are used, while the others are of no use.

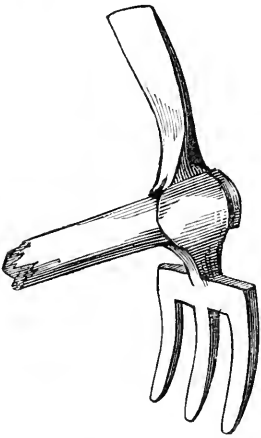
Same work, fol. 4.

The seeds are sown before the first half of the first month. The best seeds are those which are spotted black. After they are sown they are covered with ashes. If they are sown thick the plants coming from them will be weak and sickly; they will be strong and healthy, on the contrary, if the seeds are thinly sown. As soon as the leaves appear the plants are watered with liquid manure. In the seventh month the seeds are collected, put on canvas, and hung in a strong current of air; this aids and hastens germination.

XXVIII.—*On the Pickfork.* By R. Glendinning, F.H.S.

(Received August 10, 1849.)

Amongst the many implements lately brought into notice for the purpose of cultivating the garden, the one here represented is not likely so soon to be cast aside as others of greater pretensions. There is little merit to claim in the invention of an implement so simple, beyond its great utility. For upwards of six years I have had this tool in use in my grounds, and so important has it become, that in consequence of the peculiar nature of our soil, which can only be acted upon with any degree of success or advantage when brought into condition by atmospheric influences, every favourable opportunity is seized to bring it into full play; and I presume it will be readily conceded that such an implement in the hands of a stout, athletic workman must produce other and better results than the common hoe, so generally in use in our



gardens. True, it has been considered good management to skim the surface of the ground with the Dutch hoe, and scratch the weeds off with the rake, leaving the surface half an inch down unbroken, and hence a hard solid cake through which neither moisture nor air can penetrate. Such gardening is now avoided even by apprentices. Reason and common sense blush at such a practice. We therefore for once dispute the wisdom of our ancient brethren, and strenuously recommend the *Pickfork* until a better implement can be devised.

The soil of my nursery is principally a stiff loam on a bed of gravel. If worked in wet weather its friability is completely destroyed for a year or more. It becomes, when dry, as hard nearly as sandstone rock. This cohesion of its parts is retained in spite of any ordinary tool, how effectively soever it may be brought to bear upon it. In fact, under such conditions common tools are utterly and totally useless.

It was in this predicament that the *Pickfork* suggested itself to me; I therefore described my wants to a common smith, and detailed to him by a rough sketch the subject of the present remarks. It was at once found to be an implement all important to us. If modified, it may advantageously be rendered an *universal* garden tool, in truth a ladies' implement, eminently fitted for flower-garden work. For cottage gardening and for hand field-labour I know not its fellow. And one of the great advantages attending it is, that any village smith, with very little instruction, may easily manufacture it, making it heavy or light according to the particular use to which it is to be applied.

It should be observed, that the best time to use the pickfork is when the ground is between the wet and the dry. An astonishing amount of labour may be advantageously got over when it is in this condition; and to incalculable advantage.

XXIX.—*On some Moulds referred by Authors to Fumago, and on certain allied or analogous Forms.* By the Rev. M. J. Berkeley, M.A., F.L.S., and J. B. H. J. Desmazières.

To these names might be added with equal propriety that of Dr. Montagne, since the most important matter in the memoir is due to his observations. We had already examined the materials in our hands, and had satisfied ourselves as to their systematic affinities, when an accidental communication from our esteemed friend induced a complete revision, in which he has most materially assisted, and the results of which it has fallen to our share to communicate, simply from the circumstance of our having been previously occupied with the subject.

It is well known that the leaves of various trees are frequently more or less covered with a black sooty or velvety stratum, to the great detriment of their beauty, and frequently of their health and productiveness, by choking up the stomates, and thereby preventing the access of the atmospheric air to the tissue of the leaves. A case of this kind, which occurred in Ceylon on coffee, was a short time since noticed by one of us in this Journal; the orange trees in the Azores and Madeira have of late most grievously suffered from a similar affection; and Dr. Montagne has very recently given an account of an extensive disease of this description amongst the olive trees in the neighbourhood of Perpignan in 1829. Not only the leaves but the branches were more or less covered, and the harvest was materially affected. Similar growths are common on the leaves of plum, lime, hazel, rose, &c., and on the different species and varieties of the genus citrus in our conservatories. They are often, if not always, preceded by honey-dew, whether arising from aphides or from a sugary excretion from the leaves themselves; frequently too they are accompanied by some species of coccus, especially in the genus citrus. However similar they may be in outward appearance, the parasites by which these diseases are produced differ materially in structure; in some the characters are so singular, that we have thought some account of the particular group by which they are exhibited may not be uninteresting.

A portion of these plants consists of species of the genus *Antennaria*, as that of the olive mentioned above, specimens of which were gathered by Dr. Scouler in Portugal, in 1846. Others occur commonly on heath, on different species of cistus, on the Scotch fir, &c. One very highly developed form, rising an inch or more from the surface, and investing whole plants with a spongy mass, is found in the islands of the southern hemisphere and in South America; another species frequently covers the leaves of the ferns in Juan Fernandez; and one has been lately sent by Mr. Curtis from South Carolina on the leaves of *Kalmia latifolia*, which appears to be identical with an undescribed species gathered by Mr. Broome in the west of England on the leaves of the sycamore. Persoon distinguished these from other analogous productions on leaves, as Link and Nees von Esenbeck had done previously, but, without adopting their notions, he referred them to the genus *Torula*. The views, however, of the German mycologists have been confirmed by more recent observers, and the genus *Antennaria* still holds its place.

Other forms were separated by Persoon under the generic name Fumago, of which he made two sections. It is with the second of these, distinguished by the name of *Polychæton*, that we are principally concerned at present. The first consists in

great part of strata of the common *Cladosporium herbarum*, or possibly of one or more distinct species, mixed up with species of *Mystrosporium*, *Triposporium*, &c., but seldom in a very perfect state. The *Cladosporium* is commonly developed on a dusty coat of honey-dew, and affords a convenient matrix for the growth of other mucedinous fungi. This is the *Cladosporium Fumago*, Fries and Link, and comprises possibly some species even of Persoon's second section. Fries, however, has erred in including under it all species of that section, contenting himself merely with the remark, " The plant, as it occurs with us, has delicate fibres; but in the south of Europe, on the leaves of olive, lemon, &c., it forms thicker spots and fibres." To these we shall have to advert presently. Specimens of *Fumago vagans* on different leaves are published by Mougeot and Nestler,* No. 690, in their work on the Cryptogams of the Vosges Mountains; by Klotzsch, No. 68, under the name of *Cladosporium Fumago;* and by one of us in the Plantes Cryptogames du Nord de la France, Nos. 360, 361, 510, 601: but we are not aware that any species of Persoon's second section, *Polychæton*, has been so published. Under No. 601 of the latter work there is the following remark:—" Le *Fumago vagans*, décrit d'une manière incomplète par Persoon, est peut-être un état imparfait de la production que nous avons eu occasion d'observer sur les feuilles du Chêne et du Noisetier, et qui constitue notre genre *Polychæton*, dont l'organisation singulière et bien reconnue sera décrite dans un mémoire particulier que nous publierons incessamment." The intention of publication was never put in execution, though entertained so long ago as 1833, and was revived only by the transmission by the late Mr. Lea from Ohio of a species on the leaves of *Uvaria triloba*, evidently congeneric with the plant of Persoon, and which we have reason to believe is (in part) *Dematium Fuligo*, Schwein., No. 1331, and also *Gliotrichum Fuligo*, Fr. This is referred by Schweinitz, in his Synopsis of North American Fungi, to *Cladosporium Fumago*, Lk.; but it belongs evidently to Persoon's section *Polychæton*. A specimen exists in Sir W. J. Hooker's Herbarium, marked by Schweinitz himself *Cladosporium Fuligo*, but, as it appears to

* It is given there under the name *Fumago foliorum*, Pers. in litt. This was two years previous to the publication of 'Mycologia Europæa.' *Syncollesia foliorum*, Agardh., Syst. Alg., p. 32, is evidently the same thing. Chevallier figures, under the name of *Torula Fumago*, Chev., Fl. Par., vol. i. p. 34, tab. 3, fig. 4 b, a portion possibly of some *Antennaria*, or of the genus indicated by Persoon in the sectional name *Polychæton*. The mycelium, however, of Cladosporium herbarum varies greatly on different leaves. Dr. Léveillé has kindly communicated a multitude of forms, out of which several plausible species might be made from the different condition of the base from which the fertile threads are given off.

us, not the species which he communicated to Fries. It is quite evident from the account in the Systema Mycologicum that Fries did not understand the structure of the species sent to him by Schweinitz, nor indeed does his description agree with the characters assigned by him to Eschweiler's genus *Gliotrichum*. The genus, however, itself cannot stand, as it appears, from an authentic specimen communicated by Dr. Montagne, that it is in truth an Alga, and not different from *Calothrix*. A very closely allied species from Assam on twigs and leaves of a *Scepa* was at once pronounced by Mr. Thwaites, perhaps the very best authority on such a question, to be certainly a *Calothrix*.

Turpin figured a species of Persoon's section *Polychæton* in a treatise on vegetable nosology in Mém. de Sav. Etrang., tom. vi. p. 236, tab. 2, without characters, indeed, or observations, but showing very clearly that it had no affinity with the common *Fumago*. Of this, as we believe, we have a specimen from Dr. Léveillé. We have indeed received from Dr. Montagne a species supposed to be identical with *Fumago citri*, Pers., belonging to the same category as those of his first section; but it is probable that Persoon had also in his eye the species figured by Turpin, who gives us no information as to its origin. Dr. Harvey, about four years since, communicated a curious fungus on laurel-leaves under the name of *Microxiphium Footii*, agreeing in general structure with the plant of Turpin. At present the true fruit has not been discovered, though the species has proved to be common on the leaves of various evergreens, and is found occasionally on those of deciduous plants and even of herbs. Persoon, indeed, had before found the same thing on beech. It is his *Fumago fagi*.

No notice of *Fumago*, Pers., much less of the peculiar species with which we are occupied, is to be found either in the alphabetical arrangement of D'Orbigny's 'Dictionnaire,' or Léveillé's article 'Mycologie,' as far as we can perceive; nor in Mougeot's copious list in the statistic account of the department of Vosges, is there any new information.

The affinity of these curious productions to *Scorias* was at once evident, though that genus was not properly understood by Fries, who founded it; nor, indeed, could we boast ourselves of anything like complete information. Neither in the species of Persoon's section *Polychæton*, nor in *Scorias*, had we discovered the true fruit, though we had a more correct notion of the general structure of these bodies than existed in books, and were therefore desirous of laying such information as we did possess, respecting a very interesting group, before the public. Matters were in this position when the casual communication of a new genus which Dr. Montagne had lately discovered in a plant found by M. Durieu near Paris, made without any knowledge of our

being occupied with these forms, led, as said above, to a complete revision of our materials, and we have great pleasure in acknowledging our obligations to our excellent friend. This genus has been published, under the name of *Capnodium*, in the 'Annals of Natural History' for the present year; and though perhaps we should have preferred the retention of Persoon's name, we cheerfully adopt that which has been proposed by Dr. Montagne, which is altogether unobjectionable.

These plants, then, consist of a creeping thallus or mycelium composed of moniliform threads resembling those of *Antennaria*, or, as in that genus, occasionally to a greater or less extent mixed with filaments not at all constricted at the articulations. For the most part they are of a more or less bright brown, when seen by transmitted light; but sometimes portions are found nearly colourless, even when care is taken to distinguish mycelia of other fungi, which frequently occur amongst the dark threads. There is generally a cellular pellicle spreading over the surface of the leaf, from which the mycelium springs immediately, but which sometimes arises from the rooting base of its threads. A similar structure exists in many epiphytous fungi, as in *Asterina*, and even occasionally in *Cladosporium*—in such cases the pellicle being often readily separable from the cuticle of the matrix. The mycelium gives off numerous perithecia, which are vertical, and frequently more or less branched. They consist at first, it is believed, of a simple membrane, though possibly a layer of cells is deposited in the course of their development on the walls. In all cases, however, threads run up from the mycelium, either subsequently or contemporaneously with their first origin, partially covering the inner sac, and more or less closely crowded, their apices frequently extending beyond them, and forming a fringe, the cilia of which are more or less divergent, consisting of such loosely-connected joints that the ultimate articulations frequently fall off, and form doubtless one mode of propagation. These investing threads are precisely analogous to the coating in Mr. Thwaites's curious genus *Cystocoleus*, in which also the apices of the threads are free. In *Rhizonema*, an alga which is also invested with cells, the cellular coat, from the creeping habit of the genus, gives out rootlets, and the threads of which it is composed are sometimes distinctly separate from one another at the apex of the series of endochromes, which they surround. The structure is well illustrated by what takes place constantly in *Batrachospermum*, and some species of *Callithamnion*, where a descending stratum of cellular threads is given off at the base of the lower articulations of the branchlets, investing the main divisions of the plant, and increasing them in thickness. The peridia, or perithecia, whichever it may be

thought best to call them, are sometimes simple, but frequently more or less branched, obtuse, or strongly acuminated, and contain rather large delicate asci, which are doubtless, in many cases, absorbed at an early period of growth, for the sporidia are frequently abundant where there is scarcely a trace of asci, and that even before they have arrived at their full growth. In all such cases, as in *Lycoperdon*, *Scleroderma*, &c., there is little doubt that the sporidia are perfected after the delicate sac in which they were at first produced is entirely absorbed. Though necessary for them at an early stage of growth, there is no reason why they should not be absorbed when the sporidia have arrived at such a state as to be capable of increasing in size and development, as well amongst the general contents of the common peridium as in the individual ascus. Perfect fruit has not been found in all the species, and not a trace of true sporidia in the species which we have placed in the third section, though it is undoubtedly propagated by the upper articulations of the threads of the mycelium, which fall off in great abundance. It is indeed possible that some of the species may not contain asci at all, but produce their spores on sporophores, as in the genus Sphæronema, for on pressure a cloud of very minute sporelike bodies is given out from the peridia. Should this prove eventually to be the case, the name Polychæton could be retained for such species, which would form a genus amongst sporophorous fungi exactly parallel to Capnodium amongst the Ascospori. For the present, however, we must consider all as agreeing in essential structure, as indicated by the precise similarity of outward characters. *Scorias* in which Dr. Montagne has observed the asci (fig. 1) differs principally from Capnodium in the gelatinous coat which binds the threads of the mycelium together, which are indeed far more profusely developed; but a modification of this exists in what we have called *Capnodium Fuligo*. The threads of *Tricharia*, which resemble in habit and frequently in their place of growth those of Harvey's *Microxiphium*, certainly have a compound structure, and are probably rather of the nature of perithecia than flocci. Dr. Montagne has observed bipartite bodies in them; and though there is no mycelium, it is possible that the genus may not be far distant from *Capnodium*, unless indeed the crust be considered as a component part, which is at least doubtful. Dr. Montagne has once seen a body attached to one of the bristle-like processes resembling the fruit of an Helminthosporium; but he is himself doubtful whether it may not be extraneous. There is a sort of external resemblance between some *Capnodia* and *Synalyssa*, which it may be observed has lately been found in great perfection near Bristol by Mr. Thwaites. The resem-

blance, however, is but external, the whole structure of the supports of the Apothecia and their investing coat being entirely different, resembling in point of fact that of *Palmella* rather than of any fungi. *Asterina* and *Meliola*, though provided with an abundant mycelium, have no investing coat to the peridia, though in the latter rigid hairs spring from it. *Melanospora*, Corda, approaches perhaps the nearest as well in form as in essential structure, the ciliated orifice indicating the threads of which the peridium is either composed or with which it is coated, a structure, be it observed, pointed out many years since by one of us in a strictly analogous production in another series, viz., *Sphæronema blepharistoma*, Berk., and which is indicated also by the fringed orifice of *Sphæronema subulatum*. Finally, it may be mentioned as a mere matter of analogy that hairs occur amongst Melastomads, bearing a striking resemblance to the perithecia of *Capnodium* when unbranched. Sometimes they seem to be built up of a central articulated thread, with an exterior coating of cells; sometimes the interior thread appears to be entirely deficient except at the summit; but opportunity has been wanting for considering this analogy more minutely. This structure, as far as we can ascertain (after a very imperfect inquiry indeed), has not been noticed before.* It exists in the hairs on the leaves of species of *Pleroma*, *Melastoma*, *Heterotrichum*, and *Heterocentron*, and even the delicate hairs on the under surface of leaves of *Pleroma heteromallum* are of a similar though somewhat modified structure.

The characters of the genus cannot be given better than in the words of Dr. Montagne, which are, however, very slightly modified, in consequence of our having had more objects for comparison:—

Peridium crassiusculum polymorphum, lageniforme clavatum aut ceranoideum, simplex aut ramosum, è duplici strato formatum, exteriori scilicet è mycelii floccis adscendente compacto celluloso, cellulis deorsum penta-hexagonis, sursum parallelogrammis linearibusque, floccorum apicibus sæpe liberis ciliaribus, interiori mucilagineo subhyalino ferè anhisto, apice irregulariter rumpens interdum ore fimbriatum. Nucleus gelatinosus. Sporidia oblonga varie septata fuscescentia ascis latè obovoideis vel clavatis mox diffluenti-resorptis inclusa.

Mycelium superficiale libere evolutum nigrescens è floccis brevibus ramosis moniliformibus aut cylindricis articulatis fuscis densè intricatis compositum.

Hab. In Australiâ, Americâ boreali a Provincia Ohiensi ad

* Except, indeed, the hairs of Melastomads be considered as setæ. A similarly constructed seta is figured by Schleiden (Grundzüge, vol. i. p. 268), from the stem of *Dipsacus Fullonum*.

Carolinam Inferiorem, Galliâ, Britanniâ atque Hiberniâ. Scoriæ maximè affinis.

* *Flocci more or less connected by their transparent coat.*

1. *Capnodium Fuligo*, Berk. and Desm. Mycelio crassiusculo compacto a matrice secernibili; peridiis floccis processibusque ostioliformibus exasperatis; sporidiis minoribus. *Gliotrichum Fuligo*, Fr., Syst. Myc., vol. iii. p. 379. *Dematium Fuligo*, Schwein., pro parte.

On leaves of *Uraria triloba*, principally on the upper surface. Ohio; T. G. Lea, Esq. On leaves of various plants, Pennsylvania; L. v. Schweinitz. (Fig. 2.)

Forming cloth-like scattered patches which at a certain period of growth are separable from the surface of the leaf on which they grow. Flocci connected with one another by their thick transparent subgelatinous coat, running here and there as in all the species into a continuous cellular stratum, where closely pressed to the matrix. Peridia mostly simple, but sometimes forked or even trifid, lageniform, more or less pointed, rough all over with the free ends of the flocci, which are often very thick where they spring from their surface, and with ostioliform processes which are in fact abortive peridia. Sporidia minute, elliptic, with an occasional septum. Possibly perfectly developed sporidia may not have been seen. This species approaches so near to *Scorias* in structure that we have placed it in a separate section. It is thicker than the others, and more gelatinous, though looking very different from the intricate highly developed *Scorias*, which is sometimes an inch or more in thickness.

* * *Flocci distinct, peridia more or less branched.*

2. *C. Schweinitzii*, Berk. and Desm. Velutinum; floccis subcylindricis; peridiis subsimplicibus elongatis lævibus; sporidiis obovatis cellulosis; cellulis vix constrictis. *Dematium Fuligo*, Schwein., Car. p. 128 (in part). *Cladosporium Fuligo*, Schwein., in Hook. Herb. *Cladosporium Fumago*, Schwein., North Am. Fung. No. 2593 (in part).

On leaves of herbs. Pennsylvania. L. v. Schweinitz.

The authentic specimen in Sir W. J. Hooker's Herbarium is in a very bad state, but it seems to be quite different from the plant sent by the late Mr. Lea, which is evidently the species of Fries from his description: "Fibras monstravit rudes atras subreticulatas è pluribus conglutinatis, ut videbatur, formatas." The peridia are not rough with flocci or processes, and as far as has been seen are simple, though doubtless occasionally branched (fig. 3). The flocci, too, are far more cylindrical. The sporidia are different from those of the three following species, which

come nearest to it in habit and characters. We do not doubt that we shall soon obtain better specimens from Mr. Curtis, now his attention has been called to the genus. Schweinitz's *Dematium Fuligo* comprised probably several species; in his later and larger list he considered it the same with *Cladosporium Fumago*, Lk., which is clearly a mistake, and shows that he had not any definite notions as to his species.

3. *C. salicinum*, Mont. Velutinum; peridiis hic illic parce furcatis, brevibus; sporidiis oblongis septatis articulis constrictis, longitudinaliter divisis. Mont. in Ann. of Nat. Hist., 2nd series, vol. iii. p. 520.

On leaves of Willows of the section *Cinerella*. Switzerland, Roffavier. Paris, Durieu de Maisonneuve. We have it also, but in a barren state, from Dr. Léveillé.

Forming a thin, even, velvety black stratum, which even under a lens appears but slightly bristly. Mycelium moniliform, the articulations containing a single nucleus.* Peridia rather short, often obtuse, but sometimes lageniform and acuminate, sparingly forked, sometimes fringed (fig. 4). Asci broad, obtuse. Sporidia oblong, very slightly curved or oblique, oblong, triseptate, with one or two longitudinal septa constricted at the articulations. Occasionally the sporidia are obovate.

This is distinguished from the following species by its less elongated peridia, in consequence of which the stratum is velvety, and not distinctly bristly to the naked eye.

4. *C. elongatum*, Berk. and Desm. Setosum; peridiis elongatis acuminatis utplurimum simplicibus fimbriatisque sporidiis 2–3 septatis articulis demum constrictis quandoque longitudinaliter divisis. Curt. No. 1634.

On *Populus angulata*. Santee River, South Carolina. H. W. Ravenel, Esq. (Fig. 5.)

Forming a scattered setose black stratum; mycelium moniliform. Peridia very much elongated, acuminate, generally simple; orifice mostly fimbriated. Sporidia at first oblong bi-triseptate, at length broader, with the articulations constricted and the central one longitudinally septate. Intermediate between the foregoing species and that which follows, agreeing with the former in its more simple peridia, with the latter in its setose stratum.

5. *C. Persoonii*, Berk. and Desm. Setosum; peridiis confertis, subramosis quandoque irregularibus; mycelio moniliforme; articulis sæpe oblongis uniseptatis. *Polychæton Avellanæ*, Desm.

* Mr. Broome has observed two curious appearances in the filaments. In one case a few filaments were subulate with a central cavity, two-thirds of which was filled with short moniliform endochromes; in the other, the outer coat was very delicate, loose, and transversely striate.

in Herb. *Polychæton Persooni,* Desm. MSS. Curt. No. 2051.

On Hazel. J. B. H. J. Desmazières. (Fig. 6.)

Stratum distinctly setose; mycelium moniliform; joints often oblong and uniseptate; peridia crowded, oblong, or lageniform, slightly branched occasionally, but by no means constantly, rough with free filaments; orifice sometimes fimbriated. Sporidia imperfectly known.

6. *C. Citri,* Berk. and Desm. Sparsum, setosum; peridiis elongatis; mycelio ramoso moniliformi pulcherrimè reticulato; sporidiis oblongis minutis. *Fumago Citri,* Pers., Myc. Eur., vol. i. p. 10; Turpin, l. c.

On leaves of different species of Citrus. France. Persoon, Léveillé.

Stratum thin. Peridia elongated, mostly acuminate, conical, or lageniform. Mycelium consisting of beautifully reticulate branched moniliform threads. Sporidia minute, oblong; sometimes attached end to end, as observed in *C. Fuligo,* by Mr. Broome.

In this species, *C. Fuligo, C. elongatum,* and *C. Persoonii,* the sporidia start forth on pressure from the tip of the peridium. Asci have not been observed, but the sporidia are attached to each other, at least in two of the species, exactly as in many *Sphæriæ* of the subgenus *Hypocrea.*

7. *C. quercinum,* Berk. and Desm. Valdè compactum crassum; peridiis fasciculatis ramosis, strato exteriori transverse fragili; mycelio parco, articulis vix constrictis. *Fumago* (Polychæton) *quercinum.* Pers., Myc. Eur., vol. i. p. 9.

On the upper side of oak leaves. Persoon.

Stratum thick, closely compacted, easily separable from the matrix. Peridia fasciculate, lageniform, often branched, especially towards their apices, the outer coat cracking transversely. Mycelium sparing, consisting of continuous scarcely constricted threads. Sporidia unknown.

A very remarkable species, differing very much in its thick stratum, which rises half a line from the matrix, and might be compared to a little wool-comb. Persoon had this species more especially in view when he proposed his sectional name. The ticket attached to the original specimen is as follows:—"*Polychætum. Fumago quercina.* Mycol. Eur. 1. Très-rare. Diffère beaucoup des autres espèces, et appartient ou à un autre genre ou en fait un particulier."

8. *C. Caroliniense,* Berk. and Desm. Sparsum, setosum; mycelio parco; peridiis laxis ramosis, lateralibus elongatis lageniformibus; sporidiis oblongis bi-triseptatis.

On the under side of leaves of *Quercus obtusiloba,* South Carolina, Rev. M. A. Curtis.

Stratum thinly planted, but rising considerably from the matrix, so that the branched peridia are evident to the naked eye; mycelium thin; articulations elliptic, slightly constricted; peridia elongated, loosely branched, the lateral divisions equalling the main divisions in length, and, like them, lageniform (fig. 7). Sporidia oblong-elliptic, bi-triseptate, hyaline, possibly immature. *Capnodium Caroliniense* differs from the others in having the lateral peridia quite as strongly developed as the main ones from whence they spring. In this and *C. Persoonii* young germinating plants, whether from sporidia or germs is doubtful, present a triangular or tricuspidate outline, the angles at length being elongated into filaments.

9. *C. expansum*, Berk. and Desm. Latè expansum velutinum; peridiis conicis brevibus connatis sæpe filamentis brevibus liberis moniliformibus obsitis; sporidiis tri-septatis oblongis curvulis. Lea, No. 248.

Extremely common in Ohio, on the bark of *Acer nigrum*, which it clothes with a velvety stratum, rendering the trunks black. T. G. Lea, Esq. From the 'Herbarium' of Sir W. J. Hooker.

Stratum widely expanded, continuous, velvety. Mycelium consisting of branched moniliform threads; articulations almost globose. Peridia conical, rather obtuse, crowded, connate, short, scarcely branched, rough from the free ends of the moniliform threads which enter into the structure of their outer coat. Sporidia oblong, slightly curved, 3-4 septate. (Fig. 8.)

Remarkable for its widely expanded stratum and short crowded conical peridia. The sporidia possibly have not been seen mature. In this species a joint of the mycelium sometimes swells exactly as in *Antennaria*.

10. *C. australe*, Mont. Ambiens, velutinum; peridiis subdichotomis utplurimum obtusis; mycelio ramoso moniliformi, articulis diametro brevioribus; sporidiis ellipticis fenestratis.—Drumm., No. 192.

Surrounding the branches of *Coniferæ*. Swan River. Mr. Drummond. From the 'Herbarium' of Sir W. J. Hooker.

Fig. 9.—Stratum thick, velvety. Mycelium branched, composed of moniliform threads, the articulations of which are broader than long, strongly constricted, and containing a single nucleus. Peridia more or less dichotomous, obtuse, sometimes swelling at the apex and depressed, sometimes lageniform. Asci broad, obovate, containing eight elliptic sporidia, which have four or five transverse and several longitudinal septa.

Distinguished from the other species by its peculiar peridia, and from all except *C. Schweinitzii* in its elliptic fenestrate sporidia, which are not constricted at the sutures. With *C. expansum* it agrees in habit, but differs in every essential character.

*** (*Microxiphium*) *Harv.* *Peridia simple, subulate.*

11. *C. Footii*, Berk. and Desm. Maculæforme setulosum; peridiis subulatis simplicibus; mycelio subhyalino subgelatinoso. *Fumago Fagi*, Pers., Myc. Eur., vol. i. p. 10. *Microxiphium Footii*, Harv. MSS.

Extremely common on the leaves of evergreens, when it is often accompanied by *Strigula Babingtonii*, and also on the leaves of deciduous trees, as the Beech, and even on herbaceous plants, as *Mercurialis perennis* (Figs. 10 and 10*).

Forming little, generally, orbicular thin patches, which under a microscope are setulose. Mycelium subgelatinous, readily imbibing water, subhyaline, when young subcontinuous, when old distinctly moniliform; the articulations elliptic, with one or two nuclei. Peridia dark, setiform, outer coat hyaline, the threads at first cylindrical, at length moniliform, hyaline, the ultimate joints breaking off; in some states the peridia are quite naked. They frequently, but not universally, spring from a little bulbous base.

The fruit has not been observed in this species. Its discovery may warrant the formation of the genus *Microxiphium*, Harv. It is scarcely probable that the asci in so narrow a space should be of the same nature as in the other species. It occurs so frequently with *Strigula Babingtonii* that it has been suggested that it bears the same relation to that species that *Tricharia* does to certain epiphyllous lichens. It is, however, found without any trace of the lichen, and the lichen occurs equally free from the bristly threads. In the absence of all information respecting the sporidia it is impossible to come to any certain conclusion: it is, however, highly probable that both in *Tricharia* and our present species a great similarity may exist in this respect. The specimen on *Mercurialis* was at first thought distinct, but there are no sufficient characters to warrant its being kept apart at present.

We can scarcely suppose that all the species proposed above will be retained. The first and three last are, at any rate, good species; it is, perhaps, more doubtful whether all the intermediate species are equally good, though the differences are sufficiently striking. Were the fruit of all perfectly known, we might speak more confidently.

We conclude our memoir with the notice of a new genus, which is abundantly produced in certain situations in South Carolina, though the fructification is of rare occurrence. It is generally, if not always, accompanied by a new species of *Myriangium*, but has not the slightest connexion with it. The threads are cylindrical, inarticulate, fasciculate, creeping widely

over the matrix of a shining black; giving off branches from the fascicles, which are themselves fasciculate, and often confluent with one another. These are at times contained in a common sheath, exactly as in the genus Microcoleus. They are for the most part barren, but occasionally fructification is produced on the edge of the fascicles, on the free-branched apices of the threads. It consists of large, globose, dark spores, which contain a single nucleus; from which circumstance we have called it *Glenospora*. It is analogous to *Acremonium*, but that belongs to the group of *Mucedineæ*, while this belongs to *Dematia*—resembling closely the mucedinous genus *Brachycarphium*, Berk., discovered in amber by Dr. Thomas, and figured in the 'Annals of Natural History' for December, 1848.

GLENOSPORA, *Berk.* and *Desm.*

Hyphasma repens late expansum, floccis fasciculatis supra articulatis communi membraná vestitis ramosis, prope apices è fasciculis liberatos fructificantibus contextum. Sporæ amplæ globosæ, sæpe binæ coloratæ, nucleo globoso. Analogon *Acremonii* quoad fructum, *Brachycarphii* quoad Hyphasma et apices filamentorum liberatos fructificantes. Vix ulli *Dematiearum* arctè affinis.

Hab. in corticem *Nyssæ aquaticæ*, *Aceris rubri*, et *Prini verticillati*, frequens in sylvis humidis et paludibus Carolinæ Inferioris, *Myriangii* sæpissime si non semper socius.

Glenospora Curtisii, Berk. and Desm. Curt. No. 1442, 1021. (Fig. 11.) On the bark of Nyssa aquatica, Prinos verticillata, and Acer rubrum. Extremely common in South Carolina.—Rev. M. A. Curtis.

It may be remarked, that Mr. Thwaites found a very similar production, only with hyaline threads, mixed up with *Coccochloris Brebissonii*, growing in dripping places near Bristol. The fructification and the whole structure are very similar. At present it has not been found by itself, so as to enable him to ascertain its habit and colour when freely developed. The spores are dark-brown, and have a pretty effect on the colourless filaments. This may be called *Glenospora Thwaitesii*, but we have not thought it necessary to give specific characters, as we have scarcely sufficient information for this purpose. The spores of *G. Curtisii*, it may be observed, when viewed by transmitted light, have a lilac tinge, as have also the threads in portions of the stratum, but not constantly.

Description of the Engravings.

Fig. 1. Asci and sporidia of *Scorias spongiosa*, Fr., magnified 600 diameters. From a sketch by Dr. Montagne.

Fig. 2. *Capnodium Fuligo*, B. and D. Peridia, mycelium, and sporidia highly magnified. From a sketch by Mr. Broome. The threads of the mycelium to the right of the figure are evidently connected by their gelatinous integument.

Fig. 3. *Capnodium Schweinitzii*, B. and D. Flocci of mycelium and sporidia, both highly magnified.

Fig. 4. *Capnodium salicinum*, Mont. Asci with immature sporidia, and mature sporidia from the absorbed asci, magnified 380 diameters. From a sketch by Dr. Montagne.

Fig. 5. *Capnodium elongatum*, B. and D., with young and mature sporidia more or less highly magnified. From a sketch by Mr. Broome.

Fig. 6. *Capnodium Persoonii*, B. and D. The peridium is in this case ruptured horizontally, but this is by no means constant. The endochrome of the joints of the mycelium is frequently bipartite. Portions of the mycelium which have been accidentally detached are growing on the hairs of the matrix. From a sketch by Mr. Broome.

Fig. 7. *Capnodium Caroliniense*, B. and D. Outline of group of peridia and sporidia highly magnified.

Fig. 8. *Capnodium expansum*, B. and D. Sporidia highly magnified. From a sketch by Mr. Broome.

Fig. 9. *Capnodium australe*, Mont. Outline of branched peridia; a single peridium crushed and discharging its asci; young ascus, mature ascus with sporidia, and portion of mycelium, all more or less highly magnified.

Fig. 10. *Capnodium Footii*, B. and D. Peridia and mature mycelium, from *Mercurialis perennis*. Sketched by Mr. Broome.

Fig. 10*. Immature mycelium, from the same species growing on laurel.

Fig. 11. *Glenospora Curtisii*, B. and D. Portion of plant, showing the fascicles of threads with their fructifying branches; a portion of the fructifying threads separated from the fascicles, and a single spore, more or less highly magnified.

Fig. 2.

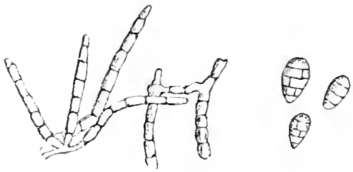


Fig. 3.

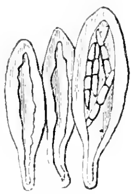


Fig. 1.

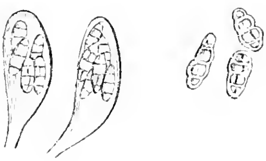


Fig. 4.

Fig. 5.

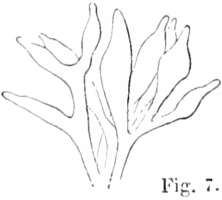


Fig. 7.

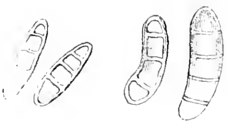


Fig. 8.

Fig. 10*.

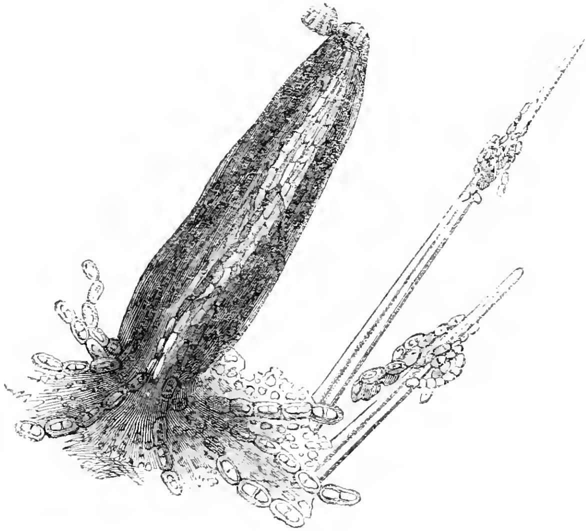


Fig. 6.

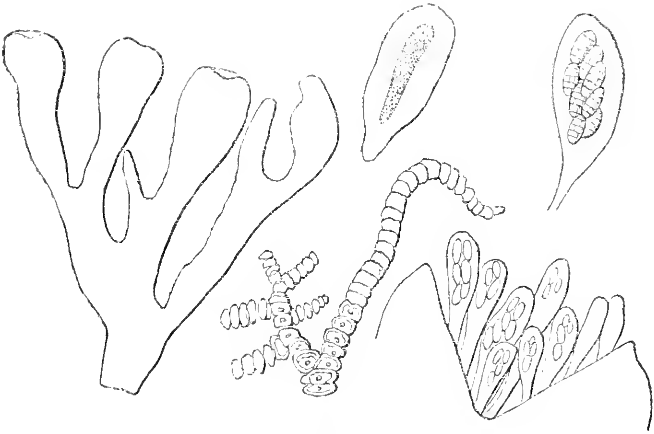


Fig. 9.

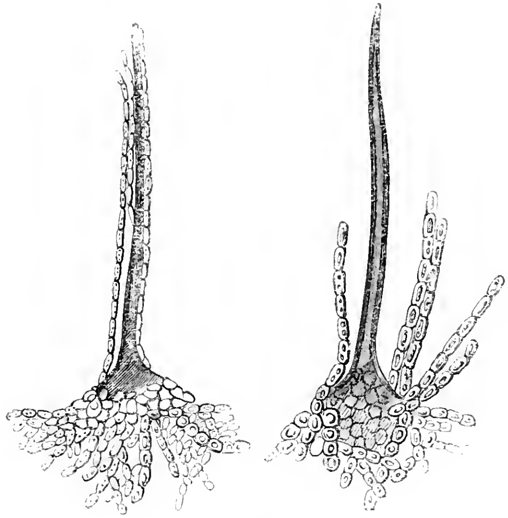


Fig. 10.

Fig. 11.

XXX.—*Memoranda concerning some new Plants recently introduced into gardens otherwise than through the Horticultural Society.* No. 1. By John Lindley, Ph. D., F.R.S., Vice-Secretary.

(Communicated Sept. 12, 1849.)

[In addition to the plants described in this Journal from the Society's Garden, I believe it will be useful to the Fellows of the Society to be made acquainted from time to time with others which appear in the various important private collections of this country and the North of Europe. Such plants are now too frequently thrown into cultivation with names which have been applied upon no known authority, which are often found erroneous, and which consequently require to be changed, to the inconvenience of their possessors. Occasional notices of the following nature will, it is hoped, tend to obviate so serious an evil.]

1. LISIANTHUS Princeps.

L. *Princeps;* caule fruticoso tereti ramulis compressis, foliis petiolatis ovato-lanceolatis acutissimis glabris, floribus solitariis pedunculo flexuoso filiformi pendulis, calyce campanulato pentagono lobis brevibus ovatis obtusis, corollâ longissimâ ventricosâ basi cylindraceâ laciniis ovatis acutis, staminibus inclusis.

Native country, *New Grenada.*

Some idea may be formed of the beauty of this plant from the following dimensions of one of its flowers. The cup of the calyx is ½ an inch deep; the corolla is 5 inches long, and rather more than an inch wide in the thickest part. These flowers hang on long terete stalks singly from the axils of the leaves, which are ovate, acute, deep green, and perfectly smooth. M. Linden, of the Luxembourg Nursery, has raised it from seed, but it has not yet flowered with him. To me it is only known in a dried state, when the colours cannot be ascertained; but they appear to have been either orange or crimson. It belongs to the section called Calolisianthus, and is undoubtedly one of the finest things in cultivation.

2. WAILESIA picta.

Wailesia. Genus ex ordine Orchidacearum, Vandæ affine. Sepala et petala æqualia, patentia; lateralibus basi subobli-

quis. Labellum sellæforme, cum columna parallelum, eæque basi saccato adnatum, medio villosum basi bidentatum; saccus inappendiculatus. Columna brevis, truncata, semicylindracea. Anthera bilocularis. Pollinia 2, globosa, dorso excavata; caudiculis 2, linearibus, divergentibus, glandulæ ovatæ alligatis—*Herba epiphyta, caulescens; foliis distichis coriaceis; pedunculis multifloris, lateralibus, erectis.*

Native country, *Java.*

This remarkable and very handsome plant has long been known to me in a dried state, as a Java species, found in that island by Mr. Veitch's collector Lobb, and bearing a near relation to the epiphytes called Trichoglottis by Dr. Blume. Alive I have had the pleasure of receiving it in great beauty from Chatsworth, where it has flowered in the course of the summer. Mr. Paxton bought it at a sale of new Orchids as "an unknown plant from Malacca."

It has the habit of a Vanda or Angræcum, with long channelled three-ribbed leaves, of rather tough texture, terminating in an acute nearly oblique point. The flower-spike rises from the side of the stem erect, to nearly a foot in height; it is deep purple, and bears from 9 to 12 flowers, each about an inch and a half in diameter; externally they are brightly spotted with crimson on a pale yellow ground; inside the spots only just show through. The sepals and petals are spreading, narrowly oblong, blunt, very nearly alike in size, form, and texture, except that the 2 lateral sepals are slightly oblique at the base. The lip is oblong, saddleshaped, blunt, and coarsely woolly at the upper end, shaggy along the middle; at the sides it is smooth, and streaked with crimson; at the base it is flattened and downy, united by the edges to the column, so as to form a small sac, but destitute of any appendage within the sac, except a small rounded callosity; above the sac, on either side, it has an obtuse linear smooth tooth. The column is a short stiff truncated body, deep yellow at the end, rounded at back, and plain in front, where it is moreover hollowed out near the base, and closely covered with a soft felt. The stigma is a small transverse oval space near the summit of the column. The anther is whitish, placed obliquely in rear of the stigma, with an ovate point, and 2-celled. The pollen masses are 2, globular, partially 2-lobed, each attached to a long narrow diverging caudicle, holding fast to a common ovate gland.

This plant is evidently very near the genus Trichoglottis, which

is distinguished by having a distinct appendage within the sac ot the labellum, and only a single caudicle for its two pollen masses; in addition to which the flowers appear always to grow in short lateral spikes, not in long erect racemes. The name which it bears is that of George Wailes, Esq., of Newcastle-on-Tyne, a gentleman who has for many years occupied himself with the cultivation and scientific study of Orchids, and to whom such a compliment has been long due from botanists.

3. Stanhopea tricornis.

S. *tricornis;* ovariis bracteis multò longioribus, petalis carnosis ovalibus convexis obliquè ovatis acutis (in icone roseis rectis nec revolutis, an semper?); hypochilio subrotundo subdepresso intus glanduloso cornubus 2 rectis labello breviore, mesochilio nullo, epichilio lineari-oblongo concavo truncato sub-3-dentato margine membranaceo dorso valde gibboso basi supra cornu recto aucto.

Native country, *Western Coast of Peru.*

A very remarkable species, sent to Mr. Skinner by Mr. Warcsiewitz, at one of whose sales it has been dispersed. The figure of the lip is most remarkable, there being a third horn at the base of the middle lobe of the lip in addition to the two always present at the side. In a figure sent home by Mr. Warcsiewitz the petals are represented to be pink and the rest of the flower white; the petals moreover are very fleshy, firm, and apparently incapable of rolling back as in the rest of the genus.

4. Angræcum Pescatoreanum.

A. *Pescatoreanum;* foliis angustis canaliculatis obliquè obtusis (lobo altero obsoleto), spicis brevibus densissimis cylindraceis, floribus extus nigro-pilosis, labello cuneato truncato trilobo calcare curvo clavato obtuso laminæ longitudine.

Native country, *the Island of Bourbon.*

For this I am indebted to M. Pescatore, an eminent banker at Paris, and the possessor of the finest collection of Orchids in France. The flowers are small, seem to have been white, and appear in short dense cylindrical spikes; the leaves are nearly a foot long, distichous like other Angreks, with a very oblique blunt end. The 2 pollen masses have each a separate caudicle and common gland.

5. Aërides suavissimum.

A. *suavissimum;* racemo oblongo horizontali (12-floro), bracteis nanis ovatis scariosis, sepalis petalisque ovalibus obtusis patentissimis, labello cornuto ascendente columnæ adpresso trilobo, laciniis lateralibus oblongis denticulatis intermediâ lineari bifidâ sublongiore.

Native country, *Straits of Malacca.*

Introduced by Messrs. Loddiges, with whom it flowered in June, 1849. In general appearance it is similar to *A. odoratum;* in fragrance more balsamic and delicious. The sepals and petals are white, with a lilac tip; the lip is pale nankin colour, with a lilac streak along the centre of the middle lobe. It differs from *A. odoratum* in the middle lobe of its lip being emarginate and much longer than the laterals, which are distinctly notched; and from *A. quinquevulnera* in its not being at all serrated as well as in its greater length.

6. Cleisostoma lanatum.

C. *lanatum;* foliis latis obtusè bilobis, racemo denso ramoso foliis multo longiore, bracteis ovatis concavis reflexis, rachi et ovario lanatis, sepalis carinatis, labelli didymi scrotiformis glaberrimi lobis lateralibus erectis acutis intermedio ovato concavo apice biseteso, caudiculâ cuneatâ bifidâ elongatâ.

Native country, *the Continent of India.*

Introduced by George Wailes, Esq., of Newcastle-on-Tyne, with whom it flowered in July, 1849. It has distichous broad blunt leaves, and a dense branched woolly raceme much longer than the leaves. The flowers are very small, like those of some Bolbophylls, and pale yellow with purple stripes. It has no beauty, but is an interesting species to botanists.

7. Warrea Wailesiana.

W. *Wailesiana;* scapo unifloro? sub flore bracteâ duplici acutâ cucullatâ aucto, ovario subpubescente, sepalis petalisque ovatis acutis patentissimis, labello subrotundo lævi, appendice 5-radiato libero.

Native country, *Brazil, in the neighbourhood of the river Parahyba.*

A fresh flower of this pretty species has been sent me from George Wailes, Esq., of Newcastle-on-Tyne, who received it from the late Mr. Gardner, it having been found by that lamented botanist in an excursion to the river Parahyba in search of Huntleya Meleagris. It appears, like that plant, to have a one-flowered scape, and is not a species of much beauty. The flowers, which smell of sweet-peas, are cream-coloured, and about as large as those of *Warrea cyanea.* The sepals are all somewhat reflexed, the lateral not being straighter than the rest; the petals are also bent back, so that no arch can be formed over the column. The lip is tinted with delicate violet along the middle, is roundish, concave, wedge-shaped at the base, not at all lobed, but so turned upwards at the edges as to look as if it was furnished with basal auricles. Its appendage consists of five slender radiating violet fingers, which are perfectly free from the lip except at their origin; at their sides the edge of the lip is also furnished with a thin, linear, inflexed membrane. The column and pollen masses are those of *W. discolor.*

8. Warrea discolor.

W. *discolor;* scapo unifloro? apice bracteis 2 inæqualibus ovario proximis quarum altera linearis, sepalis oblongis lateralibus rectis deflexis canaliculatis supremo erecto apice revoluto, petalis erectis oblongis apice revolutis, labello subrotundo obsolete trilobo emarginato concavo appendice adnato subrotundo-oblongo pectinato.

Native country, *Costa Rica.* (Purchased by R. S. Holford, Esq., at a sale of plants collected by Mr. Warcsiewitz.)

A very distinct species, apparently one-flowered, the leaves, &c., of which I have not seen. [Mr. Bassett, the gardener to Mr. Holford, states that the habit is that of Huntleya violacea, the leaves however being only about 5 inches long and 1 inch wide.] The sepals, which are $1\frac{1}{4}$ inch long, are straw-coloured, the lower straight, concave, and deflexed, the upper erect, rolled back at the point, pressed close to the petals, and with them forming an arch over the column and lip. The petals are straw-coloured at the base, dull purple at the upper part. The lip has a nearly circular outline, but is so concave as not to present that form until flattened; it is slightly 3-lobed, of a deep, dull, velvety purple colour, with, at the base, a roundish oblong yellow appendage, which adheres to the lip, and is divided at the edge into strong diverging teeth, five of which terminate so many distinct ribs. The column is yellow,

shaggy in front, with an anther sloping forward, and a subulate rostel. The pollen masses are four, plano-convex, in pairs at the end of a broad, flat, thin caudicle, furnished on either side with a lateral tooth. (A singular monstrosity here occurred in the two posterior pollen masses, which had grown together into one by a narrow neck.)

A remarkable species, the single flowers of which resemble a Lycaste, but their pollen-apparatus and lip-appendage are exactly those of Warrea. Upon this point it may be useful to explain that in Lycaste the caudicle is subulate, and the lip-appendage a truncate plate near the middle lobe of the lip, while in Warrea the caudicle is broad and flat, and the lip appendage ribbed, fringed, and stationed at the very base of the lip.

9. CYRTOPODIUM cardiochilum.

C. *cardiochilum;* racemo multifloro, bracteis ovato-oblongis membranaceis unicoloribus, sepalis petalisque oblongis obtusiusculis his (immaculatis) basi angustatis, labelli sessilis cordati trilobi lobo intermedio cordato rotundato margine tenui subplicato lateralibus acinaciformibus erectis, cristâ pulvinatâ serie quintuplici verrucosâ.

Native country, ———.

This beautiful plant exists in gardens as a variety of either *C. Andersonii* or *punctatum*, from both of which it is perfectly distinct. The flowers are large and yellow like the first, and they are slightly speckled with crimson like the second; but there the resemblance ends. At the base of the lip is to be found a convex warted crest unknown in *C. Andersonii*, and at the end of the lip there is no trace of the tubercles so conspicuous on the edge of *C. punctatum*. The specimen from which the foregoing definition has been prepared was sent me by R. Hanbury, Esq., in August, 1847.

10. ONCIDIUM sarcodes.

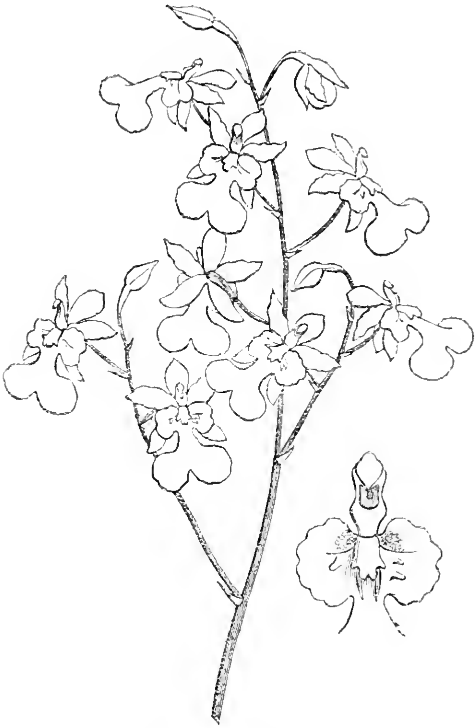
O. *sarcodes;* paniculâ racemosâ angustâ, sepalis liberis obovatis planiusculis, petalis majoribus unguiculatis obovato-spathulatis repandis, labelli lobis lateralibus nanis serrulatis intermedio maximo undulato repando emarginato, cristâ lineari apice bilobâ tuberculosâ pubescente, columnæ pubescentis clinandrio angustè marginato alis carnosis truncatis glabris.

Native country, *Brazil.*

Received in April, 1849, from Mr. P. N. Don. The habit of this species is entirely that of *O. pubes* and *O. amictum*. The flowers are large, bright yellow, blotched with brown-red; the column white, with blood-red fleshy truncated wings. In structure it approaches nearer to *O. ampliatum* and *excavatum*, from which its downy column, serrated side lobes of the lip, and peculiar two-lobed hairy crest abundantly distinguish it.

11. ONCIDIUM panchrysum.

O. *panchrysum;* foliis brevibus ensiformibus obtusis strictis paniculæ patulæ pedunculo æqualibus, sepalis ovatis acutis



planis liberis, petalis conformibus subundulatis, labelli trilobi lobis lateralibus rotundatis crispis basi pubescentibus intermedio bilobo rotundato fere æquilatis, cristâ planâ

apice subquadrilobâ verruculis quibusdam sparsis utrinque, columnâ apterâ.

Native country, *New Grenada, in the province of Socorro*, according to M. Linden's 'Herbarium,' No. 1432.

A small species, with an erect branching panicle of pure yellow flowers. From the roots to the top of the panicle is not much more than a foot, even in the wild specimens. The leaves are about 6 inches long, erect, obtuse, and as high as the stalk of the panicle. Among the peculiarities of the plant is the presence of two little patches of fine down at the very base of the lip where it comes in contact with the column. I have received flowers from various anonymous correspondents. It belongs to a group of which the well-known *O. pulvinatum* may be taken as the representative.

12. Dignathe pygmæa.

Dignathe. Pseudobulbus squamatus monophyllus. Flos solitarius resupinatus carnosus. Sepala et petala patentia æqualia. Labellum planum recurvum basi subsaccatum et per lamellas 2 carnosas columnæ adnatum. Columna nana, acuta, semiconica, clinandrio dorsali immarginato. Anthera? Pollinia 2, caudiculâ lineari, glandulâ parvâ ovali.——*Genus Pilumnæ et Aspasiæ affine; columnâ nanâ, clinandrio dorsali immarginato et habitu quodam valdè diversum.*

Native country, *Mexico.*

Messrs. Loddiges have introduced this novelty, which is among the most inconspicuous of Orchids. The whole plant is barely two inches high, and forms little tufts like an *Alamania* or *Dinema.* The pseudo-bulbs are oblong, and buried in leathery acute scales. The leaves are solitary, oval, stalked, 3-toothed at the point. The peduncle is solitary from the base of the pseudo-bulb, one-flowered, and about as long as the short keeled petiole. A keeled acuminate membranous bract is larger than the ovary. The tiny flower is green, fleshy, with a few yellowish spots upon its disk and the two succulent plates that unite it to the column. Both plates and column are downy.

13. Cycnoches barbatum.

C. *barbatum;* racemo ascendente longissimo (bipedali) multifloro (50–80), labelli trilobi basi barbati laciniis la-

teralibus erectis triangularibus acuminatis inæquilateris intermediâ rhombeo-lanceolatâ acuminatâ, ovario hirsuto.

Native country, *New Grenada.*

The first information I had concerning this very pretty plant was from M. Linden, of the Luxembourg Nursery, who, in May, 1849, sent me a specimen, with the intimation that he had obtained it from New Grenada, and that its long graceful drooping racemes bear in that country from fifty to eighty flowers. In the Exhibition of the Society, a small specimen excited universal admiration for the delicacy of its texture, its curious form, and its graceful habit. I have also received it from J. J. Blandy, Esq., of Reading. I understand that it has the pseudo-bulb of a Gongora rather than the taper stem of a Cycnoches. Its flowers are of a soft delicate flesh-colour, spotted with deeper red; the whole of the parts are so thin as almost to deserve the name of membranous; and in the middle of the 3-lobed stalked lip is a broad tuft of long half-transparent hairs.

14. Epidendrum vandifolium.

E. (Amphiglottium) *vandifolium;* foliis longis angustis distichis recurvis basi canaliculatis; racemo brevi cernuo subsessili, labelli tripartiti lobis lateralibus semicircularibus intermedio lineari retuso lineis tribus parallelis lucidis elevatis callisque 2 elongatis intra basim.

Native country, *Mexico.*

Introduced by Messrs. Loddiges, from whom I received it in April, 1849. It is nearly related to *E. fuscatum*, but its leaves are long, narrow, distichous, and recurved like those of some Vanda. The flowers are sweet-scented, dull purple, somewhat freckled.

XXXI.—*Notes on some Varieties of Peas grown in the Garden of the Horticultural Society in* 1849. By Robert Thompson, Superintendent of the Orchard and Kitchen Garden Department.

(Communicated Sept. 1, 1849.)

The names of many new varieties of Peas having lately appeared in seed-lists, it was considered desirable to grow as many of these varieties in the Society's garden as could be collected in the present season, in order to ascertain their respective merits.

Accordingly, about forty packets, including some of the old sorts for the purpose of comparison, were sown on the same day, March 21st. Abundance of rain fell in April and May, and the plants in consequence made a fair healthy growth, but their podding of course was later than would be the case in hotter and drier seasons. They were sown rather thinly than otherwise, and the pods were generally well filled. On the whole, the circumstances were favourable for correctly estimating the properties of the different sorts.

Bishop's New Long-pod.—This was presented to the Society by Mr. John Ronalds, of Brentford; sown March 21st; fit for use June 28th; about 2 feet high; pods nearly straight, almost cylindrical, containing 6 to 7 peas. An excellent prolific early dwarf white pea; far superior to Bishop's Early Dwarf, which, doubtless, it will soon entirely supersede.

Thompson's Early Dwarf.—Received from Messrs. Sutton and Sons, Reading; sown March 21st; fit for use June 28th; about 2 feet high; pods small, round, containing 4 to 5 medium-sized white peas. A tolerably prolific variety, but not equal to the preceding.

Prince Albert.—Received from Mr. Kernan, Covent Garden; sown March 21st; fit for use June 20th; about 3 feet high; this and the Early Kent appear to be varieties of the Early Frame. They are, however, not quite so tall as it, and they ripen at least a week earlier. Valuable for its earliness.

Early Warwick and *Early Race-horse.*—These proved to be, generally, the Early Frame.

Early Hero.—Presented by Mr. Glendinning; sown March 21st; fit for use July 6th; height 5 to 5½ feet. This is not a very early pea; it is, however, a good bearer; pods slightly curved, a little flattened, containing 6 to 7 medium-sized white peas of good quality.

Doigt de Dame (*Lady's Finger*).—Received from M. Vilmorin, of Paris; sown March 21st; fit for use July 4th; from 5½ to 6 feet high; pods long, cylindrical, containing 6 to 7 white peas. A good pea, but does not bear so abundantly as some others.

Shilling's Grotto.—Received from Mr. Kernan, Covent Garden; sown March 21st; fit for use June 27th; grows to the height of 4½ or 5 feet; pods short, thick, but badly filled, containing 4 to 6 white peas. A bad bearer this season.

Grimstone's Egyptian Pea.—Presented by Mr. Grimstone, Herbary, Highgate, accompanied with a pamphlet in which it

was stated that the peas under the above name were part of the product of one of three peas that were found amongst the dust on opening a vase presented by Sir Gardner Wilkinson to the British Museum; the characters on this vase proved it to be 2844 years old, or upwards, during which period it had lain buried in a mummy pit. A few of the peas received at the Garden were sown in 1848; but they did not thrive well, owing to the very dry weather in the early part of the season. Their habit of growth so much resembled that of the Dwarf Branching Marrow, that it was this year thought advisable to sow both side by side. With every advantage of comparison thus afforded by the proximity of the plants, no difference could be observed between Grimstone's Egyptian Pea and the Dwarf Branching Marrow. The growth of the plants, their foliage, flowers, pods, and seeds exhibited precisely the same characteristics.

Dwarf Branching Marrow, Syn. *New Dwarf Branching Marrow.*—Received from Mr. Glendinning; sown March 21st; fit for use July 2nd; about 2 feet high; stems strong, with short joints; leaflets broad; flowers large, rather tufted, on short peduncles, cream-coloured; pods nearly straight, flattish, containing about 6 middle-sized white peas. Only a moderate bearer.

Queen of Dwarfs.—Received from Mr. Kernan; sown March 21st; fit for use July 20th; about 18 inches high; pods large and flat, containing only 4 to 6 large white peas. A moderate bearer.

Bellamy's Early Green Marrow.—Received from Messrs. Sutton and Sons; sown March 21st; fit for use June 30th; from 4½ to 5 feet high; pods long, straight, cylindrical, containing 6 to 7 peas, some of which when ripe and dry are white; others are olive-green. A good bearer, and on the whole an excellent early pea.

Sutton's Superb Green Marrow.—From Messrs. Sutton and Sons; sown March 21st; fit for use July 14th; from 5½ to 6 feet high; pods flattish, nearly straight, containing about 6 large peas: olive-green when dry; bears tolerably; but the peas, in a young state, are not sufficiently sugary; on the contrary, they have a little of the harshness peculiar to the wild or grey pea. It is therefore not to be recommended.

New Indented Green Marrow.—Presented by Mr. Glendinning; sown March 21st; fit for use July 18th; about 5 feet high. A good pea, resembling Knight's Green Marrow; but the peas, when green, are not so sugary, and when dry they are less indented.

Victoria Marrow.—Received from Mr. Kernan; sown March 21st; fit for use July 24th; height 6 to 6½ feet; pods nearly 4 inches in length, generally in pairs, straight, roundish, containing 6, 7, or 8 large peas of good quality; olive-green when dry, and slightly indented. This variety bears some resemblance to Knight's Tall Marrow; but the pods are larger and remarkably long and well filled; like all others it is less sugary than Knight's; still the quality is very good. It is a most abundant bearer; and when we take into consideration the length of pods, the number and size of the peas they contain, it must be admitted that this is a remarkable sort, highly deserving of cultivation.

Flack's New Large Victoria.—Presented by Mr. Glendinning; sown March 21st; fit for use July 2nd; height 2½ to 3 feet; pods middle-sized, flattish, nearly straight; peas generally 6 in a pod, large, compressed, blue when dry and some partly white. A very good prolific dwarf variety.

Bedman's Imperial.—Received from Mr. Glendinning and from Mr. Kernan; sown March 21st; fit for use July 14th; from 2½ to 3 feet high; pods somewhat curved, roundish, containing generally 6 to 7 large blue peas of good quality. An excellent bearer; a variety well deserving of recommendation.

New Imperial.—Sown March 21st; fit for use June 30th; height 3½ feet; pods small, cylindrical; peas blue. On the whole, this variety is inferior to many others.

Maclean's Seedling.—Presented by Dr. Maclean, of Colchester; sown March 21st; fit for use July 3rd; height 2 feet; pods large, nearly straight, a little flattened; peas very large, compressed, of excellent quality, indented when dry, and of a bluish colour. A valuable prolific dwarf variety.

British Queen.—Received from Mr. Kernan; sown March 21st; fit for use July 23rd; about 5 feet high; pods large, straight, nearly round, containing generally 7 very large peas, nearly the size of small beans, indented when dry, and of a light olive-green colour. A good bearer. This bears considerable resemblance to Knight's Marrow; but differs in the peas being larger, somewhat thicker in the skin, and scarcely so sugary: it is, however, a valuable sort for those who prefer large peas.

Gros Vert Normand.—Received from M. Vilmorin, of Paris; sown March 21st; fit for use July 20th; height about 6 feet; pods slightly curved, rather flat, containing 5 to 7 large peas, of a bluish-green colour when dry. A tolerably good bearer, and might prove useful as a late pea.

Fairbeard's Champion of England.—Received from Mr. Glendinning; sown March 21st; fit for use June 30th: about

5 feet high; pods long, somewhat curved, and slightly flattened, containing 7 to 8 large peas of very sugary quality, indented, and of a bluish colour when dry. An abundant bearer, highly deserving of cultivation.

XXXII.—*On the Cultivation of Brunsvigia Josephinæ.* By Charles Leach, King's Road, Clapham Park.

(Communicated September 4, along with a beautiful exhibition of Brunsvigia Josephinæ and other Cape bulbs, for which a Banksian Medal was awarded.)

In sending to-day two or three specimens of Brunsvigia Josephinæ, it may perhaps further the objects of the Society if I accompany them with a short description of the treatment by which I have now, for three or four years, succeeded in blooming them.

In March, 1844, I received three fine bulbs, among various others, of Brunsvigia Josephinæ from the Cape. They were at once potted in good fresh turfy loam, and in a month the leaves appeared. They did not, however, grow finely; and in November, beginning to turn yellow, water was withheld, but resumed in December, new leaves again showing themselves. The pots were also plunged in water for a few hours, to ensure the ball of earth being fully saturated; the top mould was also taken off, and replaced with leaf-mould. During the winter they were kept in a warm green-house, in a temperature often down as low as 35°, and making leaf well. In May they were placed in a pit, kept dry, and exposed to the sun, the lights being kept closed. In the September ensuing one of the bulbs flowered, and, the treatment being precisely similar, another flowered in 1846. The first again flowered in 1847, and the second in 1848, appearing thus to require a year to recover their exhausted strength. This year forms, however, an exception, all three being now in flower, one of which is that now exhibited; and although at first the largest bulb, and always producing the finest foliage, is blooming only for the first time.

I cut the flower-stems always off as soon as the last flower begins to wither, in order that strength may not be exhausted in perfecting seed, and I then place the pots out of doors, and keep them there as late into the autumn as possible, and until the leaves are grown so long as to make them liable to injury from strong winds or heavy rain.

I have only further to add that the three bulbs have never been re-potted since I first planted them, but that liquid manure is occasionally given them when the leaves are approaching

and have attained maturity. Under similar treatment I have twice bloomed the Buphane ciliaris, and last year I had also two or three other Brunsvigias in flower. There is, therefore, not so much difficulty in blooming these plants as has hitherto been thought.

XXXIII.—*Note respecting the "Josling's St. Alban's" Grape.* By Robert Thompson.

(Received August 31, 1849.)

A NOTICE of a grape sent to the Society by Mr. Josling, as a seedling raised by him, and named Josling's St. Alban's, was published in vol. i. p. 296 of this Journal. The bunches sent had not the usual character of any known grape; and, after various inquiries as to when and how it was raised, it was concluded to be distinct. Having found its quality excellent in two seasons in which I had an opportunity of tasting it, I endeavoured to do justice to its merits. When obtained in full perfection it is generally acknowledged to stand unrivalled in point of flavour. But considerable doubts have lately arisen with regard to its being distinct from the Chasselas musqué. I have been favoured with communications from various parties to whom application had been made for their candid opinions on the subject. The matter, however, was still left in doubt; and if I could not immediately clear it up, I considered it necessary to obtain and state all the particulars I could respecting the grape in question.

With this object in view, it was thought advisable to go and inspect the situation of the original vine; compare its fruit and leaves with those of the Chasselas musqué grown in the Society's garden; and ascertain under what circumstances and by what mode of culture the vine under Mr. Josling's care produced fruit free from cracking, a liability to which is the only fault ascribed to the Chasselas musqué.

The vine is growing in the garden of A. M. Timperon, Esq., New Barns, near St. Alban's. This garden has been under Mr. Josling's management for many years. It lies low, near the river Ver, or Muse, and damps arising from the river are said to be prevalent: perhaps they are unfavourable to the red spider. The vine border has, however, a dry, gravelly bottom, and is, moreover, well raised above the general level of the garden; it was made two-and-a-half feet deep, of good turfy soil, leaves, and some lime rubbish. I consider it worthy of being well remarked, that sheep were penned on the turfy soil after it was dug up, and before it was introduced into the vine border. The

vines are planted outside. The house is 80 feet in length, but is divided in the middle, so as to form two compartments; the width is 15 feet; the height of the back wall about 13 feet; the upright sashes in front 3 feet. The rafters are straight: these and the sash-frames are all iron. There is no wood-work in the roof, front, or ends; consequently the temperature of the house is not easily kept up. The heating is by means of flues, the arrangement of which is not the best that might have been adopted; for one runs across by the partition in the middle of the house, then along the front; but without traversing the cold farther end it returns, the return portion being closely bedded on the other, so that the air of the house does not come in contact with the upper surface of the hottest flue. Another flue runs across on the other side of the middle partition, and in a similarly imperfect manner heats the other compartment. It will be understood from this arrangement that two flues, nearest the fire, run parallel across the middle of the house, whilst the two iron and glass ends have no flue to counteract their cooling effects. Altogether the house is not adapted for early forcing. A vine is trained up each rafter; and each established vine has generally a seedling of some sort alongside. One seedling, I observed, has variegated white and green foliage.

The vine which was the object of my visit (August 24) was growing about the middle of one of the divisions of the house. It was stated in the notice of it in the Journal, that it had been planted by the side of a Black Hamburgh, which was afterwards cut down: the stump is still to be seen. On comparing the fruit and leaves of the "Josling's St. Alban's" with those of the Chasselas musqué *no difference could be observed.* Mr. Josling himself agreed that no decided difference could be seen; but he was certain his vine was a seedling raised by himself. He had cut part of the crop: some good bunches, with berries free from cracking, still remained, and the quality was excellent. The bunches, however, had not such very long shoulders as those from which the description was made in 1846, probably in consequence of the border becoming partly exhausted of that nourishment which its soil derived from the sheep-pens.

That some fruits are more liable to crack than others is well known; and unfortunately the grape in question, according to various accounts, is one of those with this disposition. But under favourable circumstances grapes do not exhibit this defect. This fact cannot be disputed; and it leads to the question whether it is more advisable to study, and endeavour to command these circumstances, or hopelessly throw away some of the richest varieties of grapes? Rather than adopt the latter alternative, I have no doubt some gentlemen would go to the expense

of building a house, or large pit, expressly for the purpose of growing these kind of grapes, should other means fail.

Too much moisture, either at the root or in the atmosphere, and more especially after too much dryness, appears to me to be the principal cause of the evil. Mr. Josling merely keeps the inside of his vinery as dry as possible after the period when cracking is to be apprehended. The construction of his houses renders early forcing inexpedient; and this being the case, long-continued watering to keep down the red spider is not so necessary.

XXXIV.—*On the Management of Forest-trees considered in relation to the Durability of Timber.* By George Lovell, Gardener to the Marchioness of Hastings, F.H.S., at Efford House.

(Communicated August 27, 1849.)

Recent appeals to the experience of those interested in the durability of timber have shown that little sound knowledge obtains on this subject. To arrive at anything satisfactory in the matter an extensive series of experiments must be set afoot, and the men who may put the machinery in operation must leave the results of its action to be gathered by a future generation. We are, however, not prone to undertake investigations, the results of which can never be known to us. However disinterested we may profess to be in pursuits involving the interests of others, there is ever a self-interest or self-gratification lurking at the bottom and acting as a mainspring to our exertions. It is the necessarily protracted nature of such inquiries as the present one, that renders real practical knowledge in connexion therewith of so scanty a nature; and it is because such results *are* so protracted that so few investigations of important bearing on the subject are ever instituted.

But it appears to me that there are many points connected with the question which may be treated physiologically, and from which we may gather useful results.

With the management of the wood after the tree is felled I have nothing to do; there are no doubt many chemical processes by which a greater immediate solidity may be induced, but such means ever appear to me, like constantly physicking the human subject, affording as it does unnatural stimuli for the time being, but each successive dose only lays the foundation for an increased rapidity of reaction—a speedy dissolution when it once sets in.

That the constitution of modern grown timber is very far inferior to that which we frequently find in ancient edifices, and

after it has stood the tooth of time for centuries, is a notorious fact, and much conjecture has originated as to the causes of such marked contrast. Now it appears to me that a great amount of the causes of such inferiority in the durability of modern grown timber may be traced to the defective modes in *raising*, *transplanting*, *pruning*, and *general management* of plantation-grown timber.

As I shall treat the subject as a purely physiological one, it will, I think, be well to preface the observations which I intend to make on each head with some general remarks upon the physiology of vegetable life, keeping as near to the direct question as possible, and with the utmost brevity consistent with a clear exposition of my ideas.

To the theory of Dr. Darwin, at least to such an extent as to look upon a perfect plant as a *distinct individual*, I am a decided disciple. It is losing sight of this truthful and beautiful idea that has caused so much diversity of opinion amongst physiologists, and has ever been a stumbling-block to the practical application of their views. It is a fatality attending the birth of great truths that they should be treated harshly, and often with ridicule, even with neglect, and the theory of Dr. Darwin formed no exception to the rule. Half a century has scarcely enabled it to run alone; "yet it cannot now be doubted that the analogy that he laboured to demonstrate between plants and animals, is every day becoming more and more certain."*

That a plant† is a distinct organized being as a whole, and that each part is *but a part*, bearing certain organic relations to every other part, may, I think, be rendered evident; and I conceive it to be equally clear of demonstration, that if such an individual is by the operations of the propagator made to *assume* the appearance of several individuals, the grounds of the argument remain the same, and that each part, though it performs a separate existence, has imperfect functions, and is not a perfect individual. This is not apparent in all cases, but it is in many: I shall proceed to exemplify a few. The majority of individuals comprising the great family of Pines have each a uniform character, any deviation from which is easily detected. In many instances the loss of a branch would be as readily detected by the most casual observer as that of a limb from a quadruped. Recall the characters of Pinus Webbiana, or of Araucaria imbricata, and the truth of the argument is evident. In most of the Pinuses and analogous genera their true character is only witnessed in seedling specimens. From cuttings and grafts they

* Penny Cyclopædia.

† I mean a perfect plant, one raised from a seed.

are only abortions in figure, and have a premature decay. When the beautiful Deodar was a rarity, how was the too confiding public robbed of their money (innocently, perhaps) by pieces of trees (*i. e.* rooted cuttings) instead of whole ones; but how soon was the "murder out!" Branches grafted upon the Larch were no better; and in such cases the fault was all heaped upon the poor Larch, because, forsooth, it was not an evergreen.* And again, how many imperfect specimens of Pinus Webbiana have been fostered with anxious attention, and the results have only, as it were, mocked the labours bestowed upon them and the care with which they had been attended! A cutting from such a tree can never, or at least but seldom,† become anything more than a rooted branch, and as a natural consequence only exhibits that character. It is, I believe, become an established fact that plants produced from cuttings of Pimelea spectabilis seldom survive any lengthened period of time, and it is now a common practice to graft it upon seedlings of another species. The large plants exhibited at the metropolitan floral fêtes are, I believe, "worked" upon P. decussata. Mr. Knight found that the vitality of the apple could not be retained beyond a given period by cuttings or grafts, and that constitutional defects, as cankers, still clung to such offspring, proving the individuality and definite existence of a plant beyond all doubt.

The somewhat modernly recognised branch of vegetable physiology—morphology—is based in purpose, if not in intention, entirely upon views that would give to each perfect plant an individual existence. If we examine a seed, do we not find it composed of separate organs, each acting in concert? and the merest tyro in the science is aware that mutilation in any one part affects, and in many cases completely neutralizes, perfect organic development. Who has ever seen a healthy plant produced from a seed with one of its cotyledons (supposing it to be a dicotyledonous plant) defective? And if the several organs of a seed are necessary to produce a perfect individual, upon what grounds can we assert that such one individual can be divided into *several* perfect plants at a subsequent period of its existence?

Now as plants produce a variety of substances employed by

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* Query: How comes it that the Glastonbury thorn produces flowers and leaves at Christmas, when "worked" upon the common white-thorn?

† The laws of organic development in the vegetable kingdom render it possible for a perfect plant to spring from such a cutting, but the exception only establishes the rule. Involving, as it does, a point in the physiology of plants of no practical importance in the present inquiry, I think it best not to take the subject into discussion at present. In a future paper, and in which the subject will have a practical bearing, I hope to elucidate my views in this somewhat interesting branch of inquiry.

man, some solidity of substance for timber, others colouring matters, more secreting products for luxury or medicine, it is but fair to infer that a mutilated portion of a tree cannot produce either of these substances in such abundance as a perfectly-developed individual.

It is an axiom considered to be worthy of attentive observance in the animal economy, that careful attention during infancy is met by a corresponding rapidity and healthfulness of development in subsequent stages of existence, and *vice versâ*. And if this be true of an animal, why should it not be true of a vegetable? The period of germination is the plant's infancy, and the artificial method of planting, or rather sowing, appears to me calculated to afford everything but facility to growth. If we take the oak as an example (and it is the tree to which I shall most particularly refer), we find that no provision is made to lift the cotyledons above any extraneous matter that might from accident or design press around them. The importance of their healthy action in the economy of the young plant is presumed to be well understood. When an acorn falls and germinates, sown by Nature's own hand, how beautiful and healthy are the expanded cotyledons, wisely screened from a too excessive action of light and heat by a few decaying leaves, and with what vigour the young plant springs into life! But quite the opposite of this is the practice and results in the nursery. The earth is excavated, the acorns are thrown in, and soil is heaped over them to the depth of several inches. No atmospheric influences are calculated on. Oxygen for nourishment and for the liberation of carbon is only to be obtained by its presence in water. In this state, crowded in masses, the young trees spring into life, sorry representatives, mere ghosts of what they should have been. In this "nursery bed" they pass their first and often second and third years. Now the bedding-out abomination follows: by some means or other they are rooted out with a foot or two of "tap root," which the pruning knife quickly disposes of, and each plant shorn of its roots enjoys three inches of breathing room for another year or two, as the case may be. While this system is going on, some nobleman's forester is preparing a plantation for oaks by placing Scotch firs in parallel rows to shelter the young oaks intended to be placed between them, and in this position in due time the oaks are planted. Every precaution is taken to afford shelter to the young plants, in order "that the winds of heaven visit them not too rudely." Pampered into rapid growth by such precautions, over-crowded by their own kindred, and pressed upon by their nurses, the firs, no wonder that, instead of sturdy healthiness, of which the true character of the oak is ever recognised as the type, they are but

elongated striplings, scarcely able to sustain their own weight. And now a thinning commences, but, it must be observed, not till the trees are of sufficient size to repay by the bark, and by their own substance as poles, the outlay for the process. As the trees increase in stature many of the firs are removed, and the trees begin to breathe; but the tormentor has not yet relinquished his office. The forest pruner, guided by no better principles of practice than uniformity of distance and symmetry of form, commences his operations; with ill-directed labour the very life-giving organs of the tree are torn away, or at least the branches by which those organs, the leaves, are to be produced and borne. As you ramble through such a plantation the eye is wearied by the ever occurring semblance of ghost-like trees—stereotyped editions of effeminacy, if such a term can be applied to the vegetable world. Here, with imperfect organs of the respiratory and digestive processes, unduly excited in an elevated temperature, scarcely agitated by the gales of heaven,* a most important auxiliary, be it observed, in the healthy economy of vegetable life, no wonder that an imperfect stability of constitution should be the result, and that, when the timber is applied to the several purposes for which it would seem to be adapted, disappointment and vexation should follow. And if such timber is employed in situations where a free circulation of air cannot constantly play around it, decay is doubly rapid, from circumstances that I shall attempt to explain. In a horizontal section of an oak of considerable age, the concentric layers of wood forming its substance can readily be separated by the eye into two distinct portions, the brown centre or duramen, termed by workmen the *spine;* and the external layers or alburnum, or sapwood. As far as vitality is concerned, either in its own substance or by contributing to the other portions of the tree, the duramen may be said to be inert. Various secreted deposits, peculiar to its substance, have stopped all circulation of fluids, and rendered

* I cannot here refrain from illustrating by a case in point, and one that has frequently come under my own notice, the bad effects of securely strapping up to a stake the whole length of a young tree. A lady, who is evidently anxious to form an avenue of elms in the approach to her mansion, has been at great unnecessary labour to supply every tree with a huge pole, to which the tiny elm is securely bound *even to the very top of its leader.* I need not say that every year witnesses many deaths, and I think I shall escape the imputation of exaggeration when I add, that at the present rate of progress, supposing the present trees to survive, which is very doubtful, several lifetimes must be consumed ere anything like a tree can be produced. Negative evidence of a forcible character, as illustrating the baneful effects of such a system, is furnished by the fact that several vacancies have been filled up with trees of considerable stature, and in which the strapping process has not been deemed necessary, and which appear to be progressing favourably.

it a compact mass. The respiratory and digestive process of the tree does not exert any influence upon it, it is out of the pale of circulation. But all its imperfectly organized tissues, bloated as they are by the accumulation of undigested and watery fluids, remain mixed up with it; for the centre of the tree is composed of the first-formed layers of wood, when it experienced the worst management, and when *modern scientific* pruning unsparingly robbed it of its most essential organs, its leaves. It may possibly be urged, that as pruning takes place in the winter season, the circle of wood of the preceding summer's growth is complete, and that no detrimental effects can be experienced by the tree in consequence. But it must be urged, in opposition to this, that each layer of wood, while in the condition of alburnum, is vital, and performs vital functions; that each year it is undergoing a solidifying process; and that each separate layer of alburnum bears a certain relation to each other layer, and all to the leaves. With such facts as these, we have a forcible example of the utility of leaves. And even if pruning young plantation timber were not so prevalent as it is, the crowded manner in which the trees are placed, and the, to a great extent, unnecessary shelter by which they are surrounded, render the tissues of the leaves and, as a necessary consequence, their functions, of a very imperfect character; for it is a universally established rule in the whole of Nature's operations, that she possesses nothing that is superfluous. Does a plant become feeble or lack the means of growth? the organs by which such means would be used become diminished also. Are the facilities of respiration scanty? so are the means. Is an abundance of food to be procured? the modes of applying it are rapidly increased. The relations between cause and effect are ever preserved in their true balance.

Now I imagine that there is little fear of being accused of dogmatism, in asserting that the trees from which the timber used in some of our ancient edifices, and which has withstood the action of time for centuries, were the production of naturally sown timber, of trees which had never known the attentions of man. In feudal times men were too much occupied in warfare, in political and religious antagonism, to turn their attention to the peaceful arts, to planting for the good of posterity. Isolated cases would probably be found, but not to any extent. There is, I believe, no good evidence to prove that the "New Forest," in Hampshire, was originally planted by man. The Norman king probably set apart the extensive domain (60,000 acres) for the gratification of his hunting propensities; but that he "depopulated thirty-six villages" to form the space on which to plant the forest may, I think, be set down as a traditionary romance.

Indeed, I have met with a writer somewhere in my reading who positively asserts, from authenticated evidence, that it was originally set apart as a wild tract of land merely for the diversion of Rufus, and that he left it as he found it.

There can be little question that the practice of over-crowding trees in plantations while young is excessively prejudicial, when we take solidity of tissue into consideration. To convince one of this, it is only necessary to examine trees from both open and sheltered situations. In plantations, the true character of the tree is never developed. Tall and weakly in stature, with pale looking, elongated branches, they are like drawing-room guests, well suited for the position in which they are placed, but unfit to baffle with the storms and buffetings of every-day life. But look at a tree springing from a "self-sown" acorn, exposed to all the benefits of atmospheric and solar influence; how sturdy is it even in its infancy, how quickly does its true character develop itself! There is the indication of coming strength even in its childhood. Its sturdy arms branch out, the trunk rapidly increases, and when maturity has ripened its limbs, decay is not an ingredient in their composition.

If you cut across two trees of similar age, one from a close plantation, the other from an opposite locality, the amount of duramen will preponderate in favour of the latter, and the texture of all the wood be much firmer.

To the manner of sowing for timber-trees I would urge particular attention, because I feel confident that any amount of injury to an organized individual in the infant state is detrimental to its good progress. Surely the cotyledons of a large seed, deprived in a great measure of the agents by which its functions are to be performed, must act detrimentally to the young plant's development? And to indiscriminate pruning much important injury, both in progress and solidity, is due. The manner by which the branches are mechanically, as well as organically, connected with the trunk, when viewed in connexion with physiological principles, powerfully supports the argument. To enter fully into that inquiry would carry me to too great a length in the present paper. Certain it is that good physiological views would, if brought to bear upon forest planting and management, work wonders. Every man thinks he can manage forest trees, because it is deemed nothing more than a branch of simple labour. The days of empiricism, of dogmatism, in theory as well as practice, are on the wane. It may be that years must roll by ere much change will be perceptible as a whole, but the tide of improvement has set in, and as nothing in the present state of things is stationary, its progress is certain; all we can do to aid the cause is to join the spirit of the age, and with every effort at command to urge it onward.

XXXV.—*On Marl Hexagons, a new material for Garden Walks, with Slabs of the same for Edging.* By Alexander Forsyth, C.M.H.S.

(Communicated Sept. 10, 1849.)

Ten or twelve years ago I was at some pains to make calculations regarding the expense of gravel for garden walks as compared with slab slate pavement, and I found that at the distance of ten miles from the Kensington gravel-pits, or, in other words, in the suburbs of London, the cost of a highly-kept gravel-walk exceeded that of a slate-pavement, and yet the gravel never was at any time so clean to walk upon nor so rich to look upon as the slate, for whilst the slate showed a clean, hard face, comfortable in all weathers, the gravel was unfit for traffic of any kind for nearly one-fourth of the whole year.

I calculated the first cost of the gravel and the keeping of it for 20 years, and balanced the first cost of the slate at the wharf at Isleworth, and the cost of materials and labour in laying it down, and I found that the great depth of gravel required made the cartage an enormous sum in the first instance, and the traffic over the gravel injured so much of it that it required an annual supply to make up for that which had been soiled or swept off, whereas the cost of keeping the pavement for the 20 years was nothing.

These statements may appear startling, but a reference to figures will easily settle the matter; and the gentleman who has had his lawn mowed and swept carefully, and has had his hall paved with marble, will no doubt feel startled to find that not only his gravel-walk, but even the highly-kept grass-plat, becomes in the course of years more costly than a marble pavement, and what is still more annoying, the grass and gravel are of no value at last, after all the labour bestowed upon them, whereas good pavement is little deteriorated in value by age or usage. I mention these things in order to show the meanness of the materials generally used in the great bulk of modern gardening, and I would propose the following test by which to try the value of a garden. Suppose you were to take away the grass and just see what you would have left. You will find that this mantle has hid the nakedness and poverty of the garden, and given it a name for riches and extent which it never deserved, for the few beds of showy summer flowers scattered over acres would be easily and abundantly accommodated in the garden of the village blacksmith; by referring to actual measurement, as I have done, you will find that not one-eighth part of an acre of real flower-beds, such as scarlet geraniums or verbenas, is

to be found in many gardens that have no small pretensions to floriculture, and the gravel-walks and terraces, when soberly examined, are found to be composed of materials that would not suit a London artisan. Gravel will not do for *him ; he* must have his pathway paved with something better, hewn stone, or, at the very least, a kerb of stone and the rest pebbles. This familiar example may serve to show that we are not so far advanced in this department of gardening as we would fain believe; and although our weeds be closely wedged together, and form a matted surface which by courtesy we call grass (although in reality it is no such thing), and although the rough pebbles and smooth dirt mixed may be called a walk, the real character of the article in question is in foul weather anything but a place to walk upon. The great bulk of a grass and gravel flower-garden is composed of weeds more or less shorn to an even stubble, and of muddy pebbles more or less dry, as the state of the weather and the drainage may be at the time you make your examination. I know of only one exception to this, and that is where the proprietor has a gravel-walk in-doors, thereby insuring its condition in all weathers.

Now what I would argue from all this is, that on account of the immense bulk now occupied by coarse articles in our gardens, there is no room left for really good things, and proprietors will scarcely credit what an immense variety of rare and beautiful plants can be cultivated in a very limited space when that space is devoted solely to plants, still less would it be credited that the great expense of the labour so loudly complained of in gardens is for the high keeping of grass and gravel, neither of which are necessary.

My attention was first drawn to the expense of grass edgings by observing that where ten men mowed a certain compartment in a morning of two-and-a-half hours, it took one man five hours to do the edging with the grass shears. In front of the principal range of hot-houses at Alton Towers there is a terrace-walk paved with hewn stone and edged with quadrant-shaped kerbing of hewn stone: now the grass abutting upon this walk required no grass shears to edge it, for the level action of the scythe or of the mowing-machine left the edge quite smooth and clean. Now if all the garden had been similarly edged, one-fifth of the labour of grass-cutting would have been saved, and a garden similarly paved would answer many important purposes which gravel cannot serve, such as giving a clean, healthy promenade in the few sunny hours of a winter's day, after the snow has been swept off, when half-an-hour's exercise on a dry walk is no unimportant matter. If walks were reduced in extent and improved in quality, and if flower-plats showed less gross bulk and

more richness in their design and management, we should ere long see different requirements for horticulture.

This is no Utopian affair. I have seen the articles about which I am writing already made and highly finished, and could name the places where you can see the work done; but this is not a disputed point, and I hasten to the marl hexagon and marl edging slabs—articles that ere long must find their way into our gardens. Our ancestors had floors with a wisp of straw under foot; from that refinement has reached its present high pinnacle in-doors, and now we see encaustic tiles, with beautiful heraldic devices; and I would fain improve that part of our gardens which lies in the immediate vicinity of our houses, by having beautiful smooth, clean, hard pavement, well edged with the same, in place of dirty gravel and grass edging, and that for the reasons above stated. I have had samples of marl hexagon laid down, to try their effect, strength, and durability, and I have the written testimony before me of respectable parties who have made a similar trial of them. I have counted the cost, and beg leave to lay before the Society the following statement respecting them. The size of the hexagon is 4½ inches across—that is to say, the diameter of the circle within which the hexagon is inscribed is 4½ inches; the size of the edging-slabs 9 inches. They are capable of resisting the most intense frosts, are of a fine straw-colour, and next to the nether millstone in hardness. The cost of a fine terrace paved and edged with this elegant article amounts to a mere trifle when compared with hewn stone. I measured a handsome hewn stone terrace that had been very much admired, as forming an important feature in the garden where it was constructed, and found that if it had been laid with these it would have cost about 70*l.*, or something under the cost of a labourer's cottage; and just mark the dimensions, and think of a promenade 300 feet long, 7 feet 6 inches wide, of a fine warm tone of colour, and fit for traffic of any kind, and in all weathers.

The cost of gravel in certain localities is very great, a ton of the best coal and a ton of gravel being the same price at the water's edge, and when carted are seldom under a guinea. Now a gravel walk 300 feet long, 7½ feet wide, and nine inches deep, would cost at this rate about 65*l.* for the gravel outside the garden door, and the wheeling in and laying down of 62¼ tons of gravel are serious items to be added to the 65*l.* All the expenses attendant upon gravel form such an enormous tax upon the garden, that nothing but the evidence of figures will convince any one that such a robber is about his premises. After a good night's rain I have found the gravel from the sloping walks and from the higher levels far away from the paths where I had

left it over night, doing passive duty, having been conveyed by water from its moorings, and anchored in the fishpond beyond all recovery, deep in mud; and, independent of the heavy cost entailed by an unforeseen affair like this, the inconvenience and confusion caused by such a heavy job falling out, perhaps, in the middle of summer, where a limited number of hands were hardly able to make head against the current of other routine labour that comes before them, call loudly for some reform in this department. The inaccuracies in the formation of walks are beyond all bearing; when cut once or twice a year by a handy labourer according to the rule of thumb, they outrage all lines, levels, and parallels: look at the curves and gradients of any of the tramways from a coal-pit or a slate-quarry, and compare their engineering with ours in the science of road-making. The colour, too, is so important that our best landscape gardeners are at their wits' end to find hard, bulky articles of the right hue to make up the shades of the picture, and thus we see yellow grit and pounded brick and crystal spar employed as road-stuff, whereas the potter who has power over the clay can not only mould and fashion it to any shape, but also to any shade of colour. I have now before me a list of prices of marl hexagons,* which I dare not exhibit lest it might deter from any reform in this affair, for it is hardly to be expected that we can step from the present mud and pebble walk to the encaustic tile of various colours at one bound, and therefore I would beg leave to defer this part of the subject until I see what kind of reception this innovation upon ancient usage may receive at the hands of those who have the means to mend their ways.

St. Mary's Church, Torquay, Sept. 8, 1849.

XXXVI.—*On the Cultivation of Vines in Greenhouses.* By James Hutchison, Gardener to Colonel Scudamore, Kent Church Court, Herefordshire.

(Received July 20, 1849.)

The vine has been successfully cultivated in pine-stoves and vine-houses in Britain for many years, but its culture in the greenhouse has not been attended with equal success. This may proceed from various causes, such as the condition of the vine-border, improper temperature, aëration, &c. If the border be imperfectly drained, or the soil exhausted, the first thing to do is to remove the earth of the border to the depth of three feet,

* From Messrs. Minton and Co., Stoke-upon-Trent, Staffordshire.

if on a sloping surface, but if flat two feet will be quite sufficient. It should not be less than fifteen feet wide.

It is impossible to lay down an invariable rule as to the depth of soil which ought to be removed in every case, but I wish it to be distinctly understood that it is not necessary to dig a deep pit, as some do, for the purpose of filling it up with a mass of materials through which the sun's heat will never penetrate; for although such a border may be made of the best composition, it cannot be called a good border.

When the old soil is cleaned out, a good drain should be made along the front of the border.

In forming the new border the bottom part should have a good slope, and should be covered about ten inches deep with rough stones. Over the stones place a covering of furze, with the bushy side uppermost and the woody part under. A row of turf should be placed upon the furze, with the grassy side downward. This will form an effectual and a permanent drainage to every part of the border.

The new border should be composed of fibrous turf, leaf soil, and horsedung, which should be filled in to the depth of four feet, as it will finally subside to about three feet. It is unnecessary to prescribe the proportions to be used of the above ingredients, as that must depend on circumstances. Leaf soil is generally a scarce substance; and therefore, should the loam be of a strong quality, it should be mixed with light soil, as much of a vegetable nature as possible, keeping in view the principle that the composition should be sufficiently porous.

If the old vines have been growing in a wet soil, or a great portion of their roots decayed or rotten, I would recommend in planting them to lay a portion of the stem across the border and peg it down with strong pegs about six inches deep. As to what length ought to be laid down in this manner, that will depend on the state of the old vine. The lower part of neglected vines is generally bare of young wood, perhaps half-way up the main stem. Some of the spurs beyond that may even be exhausted. I would therefore plant so as to have a good fresh shoot at the entrance of the vine into the house, or at least at the foot of the rafter. This shoot should be cut down to two or three eyes, and if all go on well it will grow from twenty to thirty feet the first season. If young vines are required for planting, good strong vines should be procured from a respectable nursery and planted about the beginning of March. The roots should be well spread out, and three feet of the stem laid down horizontally six inches deep in the ground.

The sorts most suitable for a greenhouse are,

Black Hamburgh,
Black Prince,
Black Prince, Hamburgh,
White Sweetwater.

Temperature of the Border.

In No. 112 of Loudon's Gardener's Magazine I have directed the vine border to be covered a fortnight previous to the commencement of forcing with horsedung of the best quality to the depth of ten or twelve inches. I would still recommend the same method or something similar in every case in which the border has been uncovered or insufficiently covered during winter. But as the successful cultivation of all plants, especially exotics, depends so much on terrestrial climate, I now prefer to have the border covered in the autumn, so as to prevent the escape of the heat contained in it at that season. It fortunately happens that I have now sound data to proceed upon in giving directions in this matter. The following returns are taken from Mr. Thompson's Tables of Ground Temperature at Chiswick, which will apply with little variation to the greater part of Britain and Ireland:—

	One foot deep.	Two feet deep.
August . . .	62·37	61·95
September . . .	58·35	59·04
October . . .	52·38	53·74
November . . .	46·79	48·09

I would advise, therefore, that the border should be covered with a light covering of dry leaves about the end of September, for the temperature of the border will fall considerably in October, as will be seen from the above table. A covering of waterproof canvas should also be applied to carry off heavy rains. As soon as a sufficient quantity of leaves can be collected, they should be laid on about eighteen inches thick. Where leaves cannot be had sufficiently long, dung or fern might be used instead. But whatever material is applied, it must not be forgotten that protection from the rain is indispensable, or the heat of the border will be exceedingly variable.

The covering should be removed about the middle of May, when the border should be forked over. It should be frequently stirred with the Dutch hoe during summer, but especially after heavy rains. If the border is managed in this manner, it will seldom require any watering if situated in the western part of Britain or Ireland. In the eastern part of this island the watering of the border should be attended to when necessary, but especially at the commencement of the last swelling of the

grapes. The water should have been warmed by exposure to the air.

Temperature of the house.

If the house were covered with waterproof canvas at night during frosty weather, very little fire heat would be requisite, and vines and all plants kept in the greenhouse much benefited. In winter the thermometer should never exceed 40° when the assistance of artificial heat is required. About the beginning of March, when the buds of the vines are well swelled, the heat should be raised to 50° if dull weather, and 60° or 65° during the day if clear weather. This temperature will be advantageous to geraniums, fuchsias, &c., at this season. When the mornings are frosty in this month the thermometer in the greenhouse is generally down to 45° or 46° with me. I have had it as low as this even when the grapes were in flower, and I have never observed that they sustained any injury by this low temperature. As the season advances, of course the heat ought to be increased to 55° or 60° at night, and to 70°, 75°, or 80° during the day. 50° and 55° at night may be safely taken as a general rule for the first and second month's growth. Air will be required both night and day at all times when fire heat is necessary. In mild weather, in winter, I give plenty of air during the day, and a small portion at night also.

No front air will be required in the early part of the season unless the weather is very mild. In summer, when the nights are warm, a small portion of air should be left on all night at two lights. If the temperature be low in the morning, shut the house and give no air till eight o'clock. It might be sooner or later according to the situation of the house. It is impossible to lay down rules as to the time when air ought to be given, or the quantity requisite at all times, nor is it necessary, for this department of the business is sure to be best performed by the person who keeps general principles constantly in view, and not by him who is entirely guided by written directions. It should always be remembered that heat should accompany light, and coolness darkness.

Pruning.

I formerly recommended the long system of pruning vines as best adapted to late vineries; but as the vines must be confined to the rafters in a greenhouse, in this case I would advise the adoption of the spur system. A chief objection to this mode of pruning is, that in the course of time the spurs get long and ragged; but if the border is in tolerably good condition and covered as I have directed, the vines will push vigorously from various parts of the old wood of the spur, which may therefore

be shortened as opportunities offer. It is unnecessary to enter further into this department of the subject, as the summer pruning and the preparation of young vines for different plans of training are generally understood by gardeners.

Thinning and Pruning the Grapes.

Thinning should commence as soon as the grapes are the size of peas. They should be thinned so as not to press too much against each other when ripe. If not sufficiently thinned they will not swell properly, and many of them will rot, especially if a damp season. The great secret in preserving grapes is to keep the house thoroughly dry and as cool as possible, so that frost is excluded; therefore give air abundantly. In no case should artificial heat be applied when the house is shut, unless during severe frost and the roof of the house unprotected. It is evident that the more heat is introduced to the house the more rapid is the ascent of moisture from the lower to the upper parts of the house; and as heat and moisture are the chief agents in decomposition, the common method of applying artificial heat when the house is shut for the purpose of preserving grapes only hastens their decay.

It is not to be expected that so large a crop of grapes can be obtained from a greenhouse as from a late vinehouse pruned on the long system; but if the system is pursued which I have recommended, the produce of grapes in a greenhouse will be superior to a vinehouse of the same extent whose management is conducted without regard to the recent improvements in horticultural science.

NEW PLANTS, ETC., FROM THE SOCIETY'S GARDEN.

26. Azalea ramentacea.*

Received from Mr. Fortune, May 8, 1846, and said to be from Hong Kong.

This has something the aspect of the common white Chinese Azalea, with smaller flowers, but it appears to be in reality a very distinct species. The leaves are often nearly round, and at the

* A. *ramentacea;* foliis pilosis planis subrotundis oblongisque obtusissimis, umbellis paucifloris ebracteatis, pedicellis ovariisque ramentaceis, floribus subcampanulatis pentandris, sepalis brevibus lineari-oblongis dorso nudis apice fimbriato-ramentaceis.—J. L.

most are only oblong. The flowers have but five stamens; the sepals are very short, and bordered with long ramentaceous hairs at the edge, although they are naked on the back. There are no glands or setæ on either calyx or flower-stalks.

It is a dwarf evergreen shrub, requiring the same kind of treatment as other species of Chinese Azalea, and easily increased by cuttings in the usual way. It is very pretty and distinct, and deserves general cultivation.

March 20, 1849.

27. Echeveria laxa.*

Sent from woods near Monterey in California, in 1847, by Hartweg.

A succulent plant, with fleshy, concave, taper-pointed leaves, which when young are very glaucous, but become yellowish-green with age, and are collected in a sessile rosette. Stem weak, dull purple, about two feet long, bearing a few sessile, triangular, somewhat cordate scales. Flowers yellow, like those of Sempervivum arboreum in appearance, arranged loosely on one side of the long drooping arms of a racemose panicle. The sepals are short, triangular, glaucous, not more than one-third the length of the corolla. Instead of hypogynous scales, this species has very short truncate glands, with a concave secreting end.

The species is near E. cæspitosa, from which its acuminate leaves, and stalked, not sessile, flowers distinguish it.

It grows freely in a mixture of sandy loam and leaf-mould, and is easily increased either from seeds or by cuttings. It grows best when fully exposed, and kept rather dry in a cool greenhouse.

A very distinct-looking kind, but not one that is handsome.

July 31, 1849.

28. Echeveria farinosa.†

Rocks near Carmel Bay in California; Hartweg.

This has short succulent stems, bearing on the end a tuft of leaves as white as if they had been powdered with flour. The stem-leaves are fleshy, triangular, concave, sessile, and sagittate,

* E. *laxa;* cæspitosa, foliis rosulatis ovatis acuminatis concavis junioribus glaucis, floribus (luteis) laxè paniculato-racemosis secundis pedunculatis.—J. L.

† E. *farinosa;* caulescens, nana, foliis linguiformibus acutis planis candidis adultis viridibus, caule decumbente, racemis secundis corymboso-paniculatis, floribus pedunculatis.—J. L.

with the basal lobes turned upwards so as to rub against the stem just above the origin of the leaf. The flowers are pale lemon-yellow, with five short, truncate, concave glands.

The remarkable whiteness of the leaves, and pale lemon-colour of the flowers, are two marks which clearly limit this species.

A sufficiently hardy kind to live in a cold pit or frame from which frost is excluded, and easily increased either from seeds or cuttings. It grows freely in a mixture of sandy loam and a little leaf-mould, and requires to be kept rather dry at all times, and fully exposed to the light.

It is one of the less ornamental kinds.

July 31, 1849.

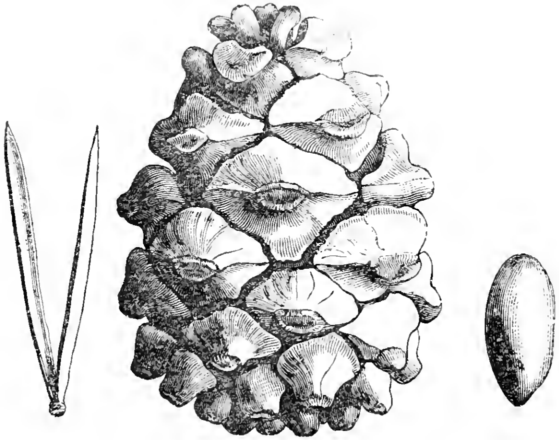
29. Pinus Fremontiana. *Endlicher, Synopsis Coniferarum*, p. 183, No. 112. Pinus Monophylla, or Nut Pine. *Torrey and Fremont.* P. Llaveana, with a thin-shelled seed. *Hartweg, in Hort. Soc. Journal.*

Found in California by Hartweg.

Leaves generally in threes, but not unfrequently in pairs or even solitary, from $1\frac{1}{2}$ to 3 inches in length; of a glaucous green, more or less curved, very stout, rigid, and ending in a spiny point, sheaths very short and rolled backwards on the older leaves. Seedleaves from eight to ten but mostly nine in number, rather long and very stout. Branches numerous, the principal ones round the stem in a whorl; bark smooth and of a light brown colour. Buds small, cylindrical, $\frac{3}{4}$ of an inch in length. Cones of a light glossy brown colour, $2\frac{1}{2}$ inches long and $1\frac{3}{4}$ broad in the widest part, which is near the middle: each cone contains from six to seven rows of scales. Scales very thick, largest near the middle, bluntly pyramidal, slightly angular, and more or less recurved downwards, particularly the smaller ones nearest the base; they are also without any points. Seeds wingless, oblong or egg-shaped, half an inch in length, bright yellow more or less stained with dark brown, and the shell so thin that it is very easily broken between the finger and thumb. Kernel very pleasant in flavour and also nutritious, as it constitutes the principal subsistence of the Indians who live in the mountains where it grows, for nine months out of the twelve.

It was first discovered by Captain Fremont, during his 'Exploring Expedition' when crossing the Sierra Nevada, or Great Californian Mountains, growing upon both sides, and extending over the top of the great Snowy Chain for a distance of 300 miles. The tree seldom attains a height of more than 20 feet, or 8 or 10 inches in diameter, but is very branching, and has a

peculiar but pleasant odour when bruised. It is perfectly hardy, for Captain Fremont frequently found the thermometer at 2° below zero at night, and 4 feet of snow, where it grew. The cones are produced in great abundance. The seeds are gathered by the Indians for their principal winter and spring subsistence, and are either taken out and kept dry in their huts or left in their natural storehouse, the cones, in heaps under the trees, where they remain tolerably dry until wanted for use; the Indians are said to live upon them alone for months and months without any other kind of food.



Cone of Pinus Fremontiana: *a*, a pair of leaves; *b*, a seed.

Dr. Torrey first gave the name of "monophylla" to this Pine from a supposition that the leaves were mostly solitary; but Professor Endlicher, who afterwards examined more perfect specimens, found that the leaves were in twos and threes, and that the solitary leaves arose from Dr. Torrey's specimens being gathered from stunted plants; he consequently altered Dr. Torrey's name of monophylla to that of Fremontiana, in compliment to Captain Fremont, its first discoverer.

Shortly before leaving California for England, Mr. Hartweg was informed by persons at Monterey that seeds of the Nut Pine might still be obtained from the Indians in the mountains, who at the proper season bring them down to the coast for sale. Upon this information, Mr. Hartweg made a journey into the mountains and found a few seeds still remaining at one of the Indian huts, and two cones which he purchased from the inhabitant. The seeds being in tolerably good condition at the

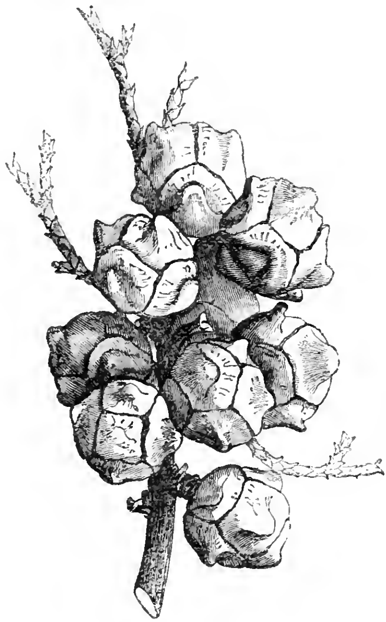
time, soon came up after being received at the Gardens, and a portion was distributed under the name of "Pinus Llaveana, with a thin-shelled seed."

This Pine will be found a very desirable plant, although not one for timber, but for its beautiful almond-flavoured nuts, which may be grown in England, in the same way as the Stone-pine is in the South of Europe.

30. Cupressus Goveniana. *Gordon.*

Raised from Californian seeds collected by Mr. Hartweg.

Leaves imbricated, blunt, thickly set in four rows and bright green on the old plants; expanded, awl-shaped, very distant, more or less reflexed, sharp pointed and rather slender on the young plants. Branches very irregular on the main stem, some being



[Cupressus Goveniana

opposite, others alternate, very numerous, slender and rather pendent; lateral branches spiral, frequently opposite, very dense, and of a beautiful bright-green colour. Cones in large clusters, globular, ½ an inch in diameter, each having from six to eight

scales, which are nearly all four-sided and elevated in the centre to a blunt point. Seeds numerous to each scale, rather small, dark brown, without vittæ, irregularly angular, and membranous at the edges. Seedleaves mostly in threes, seldom in fours.

This fine Cypress was first discovered by Mr. Hartweg, on the western declivity of the mountains of Monterey in Upper California, within two miles of the sea shore, in company with Pinus muricata, forming a dense bush from 6 to 10 feet in height. It is at once distinguished from the other Californian species by its very much smaller cones and more spreading, slender, somewhat pendulous branches. It has the same beautiful bright green colour, both in its foliage and branches, as Cupressus macrocarpa, and is a most desirable evergreen, which will prove quite hardy.

It has been named in compliment to James Robert Gowen, Esq., the Society's present Secretary.

G. G.—*Sept.* 12, 1849.

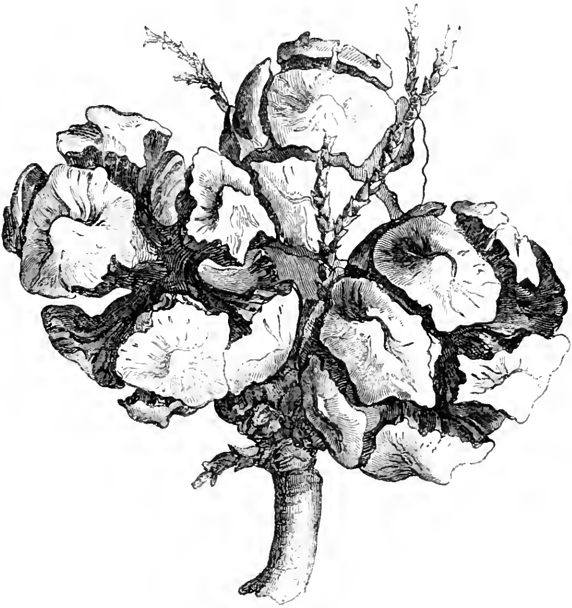
31. Cupressus macrocarpa: *Hartweg, in Journal of Hort. Soc.*, vol. ii. p. 187. C. Lambertiana of the gardens.

Found in California by Mr. Hartweg.

Leaves ovate, imbricated, in four rows, bright grass green and closely set upon the old plants; they are expanded, awl-shaped, sharp pointed, and thickly set, upon the young plants. Branches irregularly spiral, but sometimes alternate or opposite, younger ones and laterals opposite, dense, and quite green, older branches dark brown and nearly horizontal from the main stem. Cones in clusters of three or four together, oblong, 1½ inch long and 1 inch broad, with ten scales, the larger of which are in the middle and generally six sided. Seeds large dark brown, and more or less angular. Seed-leaves in fours, but sometimes only in threes.

In the year 1838 the late Mr. Lambert gave the Society a few seeds of this Cypress without any name or indication of whence he had obtained the seeds; from these plants were raised, which, when large enough, were at once seen to be very distinct from any previously known. The name of C. Lambertiana was applied to them, both in compliment to Mr. Lambert, and also to mark from whence they were first obtained; and as the plant was very easily increased by cuttings, it was soon to be found in all good collections under that name. Nothing, however, was ascertained concerning the country from whence it came until some two or three years afterwards, when I observed, on visiting Mr. Low's nursery, at Clapton, a plant of the

same kind which they had received from Dr. Fischer, of St. Petersburg, as a new species of Cupressus from California. At a later period, Mr. Hartweg, when in Upper California, discovered it, and finding it had very large fruit, gave it the name of C. macrocarpa, which, having been published in the Society's Journal, takes precedence of the unpublished though general name of C. Lambertiana.



[Cupressus Lambertiana.]

It is one of the finest plants yet introduced as an evergreen tree, not only on account of its beautiful bright green aspect, but for its great size and hardiness. Mr. Hartweg found it forming a tree 60 feet high, with a stem 9 feet in circumference, on the wooded heights near Monterey in Upper California, and with far-spreading branches flat at top, like a full-grown Cedar of Lebanon, which it very much resembles when old. It is perfectly hardy, and will grow in almost any kind of soil which is not very poor.

G. G.—*Sept.* 1849.

32. VAGARIA PARVIFLORA. *Herbert, Amaryllid.*, p. 226. Pancratium parviflorum. *Redouté, Liliacées*, vol. viii. t. 471.

Received from Bogota by C. B. Warner, Esq., and by him presented to the Society in October, 1847.

A bulbous plant, with oblong, somewhat plaited, fleshy, dark-green leaves, tapering into a distinct petiole, about 8 inches long and 2¼ broad, when full grown, pale green beneath, but not at all glaucous. The scape, which bears an umbel of about five flowers, is the same height as the leaves, a little compressed, and solid. The flowers are small, firm, white, with a greenish tube, and a roundish, bluntly three-cornered three-celled ovary, with two ovules suspended side by side to the middle of the axis of each cell; they have a weak agreeable odour, like that of new hay; their stalks are about an inch long. The spathes are narrow, withered, brown membranes. Stamens erect, with a broad acutely trifid filament; anthers linear, attached by the middle; style straight; stigma bluntly three-lobed.

The flowers of this very rare plant have been well figured by Redouté, but the leaves which he has represented do not belong to it; they are very like those of an unknown bulb, also from Bogota, and received from Mr. Warner at the same time as this. The leaves of V. parviflora are similar to those of a Griffinia. Dean Herbert's conjecture that the species is a native of Spain or Egypt is not confirmed by the discovery of its New Grenada origin; but at the same time the French report of its being an Australian plant is contradicted. Whether or not it may be referable to some one of the South American Pancratioid forms of Amaryllids is not quite certain; it, however, appears to be different, and therefore Dr. Herbert's name is retained. Certainly it is no Pancratium, for the filaments are not joined into a cup. It is very near Eurycles, from which the flower differs in nothing except in the anthers being fixed by the middle instead of by the base. The fruit is at present unknown.

A tender bulb, needing the protection of the greenhouse, and requiring the same kind of treatment as Amaryllis. It is best grown in a mixture of sandy loam and a little rotten dung, and s increased in the usual way.

A neat, but not a very showy plant.

Aug. 1849.

END OF VOL. IV.

London: Printed by WILLIAM CLOWES and SONS, Stamford Street.

INDEX

TO THE

FIRST FOUR VOLUMES OF THE JOURNAL OF THE HORTICULTURAL SOCIETY.

B.

D.

E.

H.

L.

M.

N.

O.

P.

Y.

Z.

PRINTED BY W. CLOWES AND SONS, STAMFORD STREET.

PROCEEDINGS AT MEETINGS OF THE SOCIETY.

September 5, 1848. (REGENT STREET.)

ELECTIONS. Lord Rokeby, Hazlewood, Watford; J. G. Lye, Esq., Holly Lodge, Turnham Green; J. Vere, Esq., United University Club; J. S. Bedford, Esq., Pendree, Penzance, Cornwall.

AWARDS. *Knightian Medals:* To Mr. Mylam, gardener to S. Rucker, Esq., F.H.S., for a well-flowered plant of Phalænopsis grandiflora. To Mr. Groom, F.H.S., for specimens of Lilium lancifolium album and speciosum from his fine collection at Clapham.

Banksian Medals: To C. Webb, Esq., F.H.S., for a plant of the variety of Stanhopea graveolens called venusta. To Mr. Ivison, gardener to the Duchess Dowager of Northumberland, F.H.S., for ripe fruit of the Allspice (Myrtus pimenta) and two ripe Nutmegs (Myristica moschata); the latter had both split and showed the beautiful red interior—one, the smaller, into two halves, the other into four valves or quarters, a circumstance unusual with this fruit, which seldom divides itself more than once.

Certificates of Merit: To Mr. Bunney, of Stratford, for Dendrobium formosum. To Messrs. Rollisson, of Tooting, for the brilliant red-blossomed Cape Heath called Cerinthoides coronata. To Messrs. Garaway, Mayes, and Co., of Bristol, for a variety of Miltonia spectabilis from the Organ Mountains, in which the light petals of the species were exchanged for purple ones, rendering the blossom self-coloured. To Mr. Green, gardener to Sir E. Antrobus, Bart., F.H.S., for a finely-blossomed specimen of Dipladenia crassinoda. To Mr. Wilmot, F.H.S., for a well-grown fruit of the Prickly-leaved variety of Cayenne Pine-apple, weighing 5 lbs. 4 oz. To Mr. Bray, gardener to E. Lousada, Esq., Peak House, Sidmouth, Devon, for a Black Antigua Pine, weighing 5 lbs. 12 oz. To Mr. Middleton, gardener to the Hon. and Rev. J. Norton, of Chertsey, for a bunch of Black Hamburgh Grapes weighing 2 lbs. 1 oz.

MISCELLANEOUS SUBJECTS OF EXHIBITION. Miltonia candida with thirteen flower spikes, Dendrobium formosum, and the curious Oncidium macranthum, pretty, but not so much so as the species was expected to prove, from Mr. Mylam; Dendrobium triadenium, a variety of Saccolabium Blumei from Moulmein, and a specimen of their Java Rhododendron, together with a coloured drawing of its yellow variety called Aureum, from Messrs. Veitch; various Allamandas, and Stanhopea Wardii and graveolens, from Messrs. Rollisson; Leschenaultia splendens and Mr. Backhouse's Achimenes venusta, from Mr. Green; Cyclamen Neapolitanum, from Mr. Cuthill, of Camberwell; Gladiolus Brenchleyensis, a brilliant red variety, from Mr. Charlwood, of Covent Garden; Echites Franciscea, a purple, white-eyed, Brazilian species, from Mr. Ivison; a smooth-leaved Cayenne Pine-apple, weighing 4 lbs. 15 oz., from Mr. Wilmot; three large obovate orange-coloured Cedrati, with thick, wrinkled, spongy rinds, which are sometimes made into a preserve, from Mr. Bray; the latter are the Median apples of the ancients, and are cultivated in the southern parts of Europe, where they are esteemed for their fragrance and beauty, and for the essential oil which they produce; specimens of a Seedling Apple, gritty and deficient in flavour, came from Mr. Camden, of Hounslow; a dish of Figs from the open wall from Mr. Silverlock, of Chichester; a contrivance for supporting Hyacinths, consisting of pierced rings through which wires were passed upwards to support the tops and downwards into the glasses to keep the apparatus steady, from Mr. Hamilton, of Cheapside; samples of cloth (waterproofed by some oily or resinous substance), which was stated to be better adapted for covering greenhouses and frames in winter than Russian mats, from Mr. Yexley, of Merton; and finally, a Palm-leaf, exhibiting a bad case of burning, occasioned by the employment of British sheet-glass in his conservatory, from J. H. Barchard, Esq., of Putney Heath.

NOVELTIES FROM THE SOCIETY'S GARDEN. The new Mexican Miltonia Karwinskii, figured in p. 83; Achimenes candida; Nemophila (speciosa) maculata, described at p. 320, vol. iii.; a pink-flowered Anemone, a hybrid between A. japonica and vitifolia; and a trayful of the small, round, black fruit and leaves of the Morelle de Guinée, a name under which seeds were sent to the Garden by M. Vilmorin, of Paris, last spring, and from which the specimens exhibited were raised. The common Morelle of the French

is the Black Nightshade (Solanum nigrum), which is generally considered to be poisonous. The Morelle de Guinée differs from the common Morelle in having much larger leaves, even when grown in the same kind of soil. The leaves of both sorts, it appears from the following extract from 'Le Bon Jardinier' of 1846, may be eaten like Spinach :—"The Morelle (Solanum nigrum) is an annual, growing naturally in Europe and America. It has hitherto been considered a dangerous plant in France, where, consequently, it has been treated as a noxious weed; but it appears that the leaves may be used as Spinach. Although it belongs to the Solanum tribe, it is, perhaps, not unwholesome. It is extensively used in the Mauritius under the name of Brède, and likewise in the West Indies under that of Laman. Many of the Creoles who came to France searched for the plant and ate it without experiencing the least inconvenience. This plant may therefore afford to horticulturists another resource for the summer season, and can be easily increased by seeds, sown where the plants are intended to be grown, in any open space in March, April, and May." Notwithstanding, however, this favourable account of a plant which has always been regarded as a poison, due caution was advised in testing its qualities.

Books Presented.

Materials for a Fauna and Flora of Swansea and its Neighbourhood. By L. W. Dillwyn, F.R.S. From the Author.
Journal of the Royal Agricultural Society of England. Vol. IX., Part 1. From the Society.
Review of the Agricultural Statistics of France. By the Right Hon. the Earl of Lovelace. From the Author.
Flora Batava. Nos. CLII. and CLIII. From His Majesty the King of Holland.
The Quarterly Journal of the Geological Society. No. XV. From the Society.
Ricerche intorno ad alcune Specie di Aceri. By the Cavalier Michele Tenore. From the Author.
Annals of the Lyceum of Natural History of New York. Vol. IV., Nos. X. and XI. From the Society.
Comptes Rendus des Séances de l'Académie des Sciences, tome 26, and Tables des Comptes Rendus, &c., tome 25. From the Society.
The Athenæum for August. From the Editor.

October 3, 1848. (Regent Street.)

Elections. O. C. Lane, Esq., Clifton, Bristol; M. Ricardo, Esq., Kiddington, Oxfordshire.

Awards. *Banksian Medals:* To Messrs. Loddiges, of Hackney, for a collection of Orchids; more especially for Oncidium oblongatum, a somewhat scarce species, and a specimen of the self-coloured variety of Miltonia spectabilis. To Messrs. Rollisson, of Tooting, also for a collection of

Orchids in which were well-flowered plants of Epidendrum vitellinum and Phalænopsis grandiflora. To Mr. Henderson, gardener to Sir George Beaumont, Bart., of Colorton Hall, for a Queen Pine-apple, well ripened and handsomely grown, weighing 6 lbs. $2\frac{1}{2}$ oz. To F. Gye, Esq., of Springfield, Surrey, for a basket of Black Hamburgh Grapes, eleven bunches of which, together with the basket, weighed 17 lbs. They were well swelled and coloured, and remarkable as being the produce of vines planted on the 15th of May last. They had been grown on Mr. Crawshay's plan, without the aid of fire-heat, except so much as was required to keep out damp.

Certificates of Merit: To Messrs. Veitch, for Oncidium onustum, a dwarf, yellow-flowered Peruvian species, new to gardens. To Mr. Glendinning, F.H.S., for an unnamed Angelonia, remarkable for its strong odour of Musk. To Mr. Povey, gardener to the Rev. J. Thornycroft, Congleton, Cheshire, for a Providence Pine-apple, from a plant twenty-one months old, weighing 9 lbs. 4 oz.

Miscellaneous Subjects of Exhibition. Gloxinia fimbriata, a French variety, with the habit of an Achimenes, and white flowers spotted in the throat with yellow and purple, and two plants of a new yellow-fruited Peruvian Capsicum, less pungent than the common Capsicum, from Messrs. Veitch; Impatiens repens, a new Ceylon kind of Balsam, with a trailing habit and bright-yellow flowers, from Messrs. Jackson, of Kingston; two trays of Autumnal Roses, consisting of—*Hybrid Perpetual:* Lady Sefton, lilac blush; Lady A. Peel, rosy carmine; Louis Bordillon, rose; Jacques Laffitte, cherry crimson, edges pale; Mrs. Elliot, rosy purple; Comtesse Duchatel, rose; La Reine, pink tinged with lilac; Dr. Marx, carmine; Marquisa Boccella, pink, blush edges; William Jesse, crimson, tinged with lilac; Madame Laffay, rosy crimson; Edward Jesse, crimson, shaded dark purple; Baronne Prevost, pale rose; Duchess of Sutherland, ditto; Lawrence de Montmorency, rosy pink, tinged with lilac; Du Roi, or crimson; Mogador; Madame Aimé, pale flesh, nearly white. *Bourbon:* Acidalie, blush white; Amarantine, purplish rose; Comte d'Eu; Madame Desprez, rosy lilac; Celiméne, clear blush; Irina; Armosa, bright pink; Comice de Seine et Marne, crimson; Queen, fawn-coloured rose; Pierre de St. Cyr, pale rose; Vicomte de Cassey, lively red; Le Grenadier, light crimson; Duc de Chartres, deep rose; Souchet, deep crimson purple. *Tea:* Caroline, blush pink, centre rose;

Comte de Paris, light crimson, tinged with lilac. *China:* Mrs. Bosanquet, pale flesh; Cramoisie supérieure, velvety crimson, from Messrs. Paul, of Cheshunt; a bunch of Muscat of Alexandria Grapes, weighing 2 lbs. 8½ oz., though it had lost nearly 1 lb. from berries having dropped off, and from its having been cut and sent to London a week before the meeting took place, from Mr. Hutchison, gardener to A. L. Gower, Esq., of Castle Malgwyn, Pembroke. This and a bunch of Black Hamburgh Grapes weighing 4 lbs. was the produce of vines grown on a border constructed as described at p. 303, vol. ii. J. Allnutt, Esq., of Clapham, sent Grapes in which it was stated mildew had been cured by means of free ventilation and occasional fire-heat at night. Branches of his New Monthly fruited Raspberry, profusely loaded with ripe fruit, were produced by Mr. Rivers, of Sawbridgeworth; and from J. Penn, Esq., of Lewisham, came the fruit or seeds of Cycas revoluta, being round, flattened, reddish-coloured nuts, which may be eaten like hazel nuts, and which are produced on the edges of small buff-coloured woolly leaves. It was stated that a kind of Arrowroot prepared from similar plants was used as food by the natives about Vera Cruz and other parts of Mexico.

NOVELTIES FROM THE SOCIETY'S GARDEN. A new Callistemon (brachyandrum) from S. Australia, having numerous tufts of crimson stamens, surmounted by yellow anthers, the one contrasting well with the other; Cestrum viridiflorum, a highly fragrant species; and Satyrium Herschelli, a variety nearly related to S. erectum. In consequence of the supposed difficulty of cultivating this and other kinds of terrestrial Orchids, which comprise some of the most beautiful herbaceous plants in existence, it was mentioned that the Society had taken some pains to obtain a collection, with the view to ascertain whether they are cultivable or not, and the plant in question was produced as one result of the experiment, which it was stated had as yet proved successful. The plant shown, though far from the prettiest of its race, exhibited the best of health.

BOOKS PRESENTED.

Essai sur la Végétation de l'Archipel des Féröe; comparée à celle des Shetland et de l'Islande Méridionale. By Ch. Martins. From the Author.

Note sur l'Accroissement en Diamètre de quelques Souches d'Arbres résineux, après la suppression de leur tige, addressée à l'Académie des Sciences; quelques Notes sur l'Accroissement des Arbres Exogènes; et Projet de Décret relatif à l'Enseignement de l'Horticulture, présenté au Ministre de l'Agriculture et du Commerce, le 1er Août, 1848. By M. A. du Breuil. From the Author.

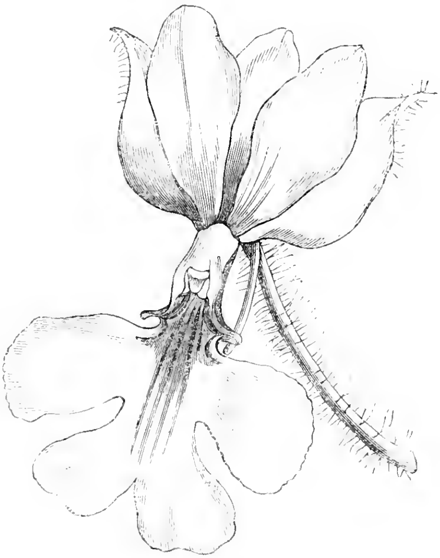
The Athenæum for September. From the Editor.

Annales de la Société d'Horticulture de la Gironde, 2me Année. 6me. Numéro. From the Society.

November 7, 1848. (REGENT STREET.)

Various alterations in the by-laws were read for the first time by order of the Council, as directed by the Charter, and then suspended in the meeting-room.

AWARDS. *Large Silver Medal:* To Messrs. Veitch, for Calanthe vestita, a most beautiful new species from Moulmein, having fine spikes of large white flowers stained in their centres with crimson. Among the many Orchids which have been imported of late years to our gardens, this is one of the most handsome and striking.



Calanthe vestita.

Banksian Medals: To Mr. Henderson, gardener to Sir George Beaumont, Bart., of Colorton Hall, for a Queen Pine-apple, ripe and well formed, weighing 5 lbs. 14 oz. With this came another Queen Pine, weighing 6 lbs. 1 oz.; but the latter was not sufficiently ripened. To J. G. Nash, Esq., of Bishop's Stortford, for a basket of Grapes, containing beautiful bunches of Black Hamburgh, Cannon Hall Muscat, and Muscat of Alexandria. These were from the same vines which produced such a heavy and fine crop last year, and concerning which some account has been given in the Proceedings of the Society for 1847, p. xiv.

Certificates of Merit: To Mr. Jones, gardener to E. J. Hutchins, Esq., of Dowlais House, Glamorganshire, for a Queen Pine-apple, weighing 5 lbs. 2 oz. To Mr. Bray, gardener to E. Lousada, Esq., Peak House, Sidmouth, Devon, for a Queen Pine of similar weight. To Mr. Davis, of Oak Hill, East Barnet, also for a Queen Pine, weighing 5 lbs. To the same, for a basket of well-ripened Muscat of Alexandria Grapes.

Miscellaneous Subjects of Exhibition. Æschynanthus speciosus, a Java species, the most brilliant of the genus, from Messrs. Veitch; a sweet-scented Burlingtonia, perhaps Cumanensis, and Solenidium racemosum, a useful though not handsome Orchid, from Mr. Beck, of Isleworth; Lælia furfuracea and two other Orchids, from Mrs. Lawrence, of Ealing Park; a Queen Pine-apple, weighing 4 lbs. 8 oz., from Mr. Jones, gardener to E. J. Hutchins, Esq.; three fruit of the same variety of Pine-apple, weighing 3 lbs. 13 oz., 4 lbs. 7 oz., and 4 lbs. 12 oz., from Mr. Davis, of Oak Hill; a Providence Pine, weighing 6 lbs. 15 oz., from Mr. Bray, gardener to E. Lousada, Esq.; specimens of Brussels Sprouts, from Mr. Appleby, market-gardener, Burton-upon-Trent; and a large ripe Vegetable-Marrow, from Mr. Cuthill, of Camberwell.

Novelties from the Society's Garden. Epidendum cerartistes, and Selago distans—the latter a very pretty hardy greenhouse autumn-flowering Cape shrub, which no small collection should be without. The latter, although very soft-wooded, in full growth, and covered with its delicate blossoms, had been exposed to the temperature of 29° in the large conservatory without sustaining the smallest injury.

The fruit from the Garden consisted of some handsome Beurré Diel Pears from a wall, and of the Mère de Ménage Apple, a kitchen fruit which attains in rich soils as much as 14 inches in circumference. It is an excellent keeping sort, and, the tree being a great bearer, it deserves extensive cultivation; also Claygate Pearmain, a rich dessert Apple; Traveller, a tender-fleshed variety, which, like the preceding, has a Ribston Pippin flavour; Syke House Russet; Coe's Golden Drop, a small brisk, rich, dessert variety, worthy of being grown where quality and not quantity is the object; Court of Wick, one of the best dessert Apples; and Hubbard's Pearmain, a capital dessert variety, which, this season, is thickly russeted; but which, in fine summers, comes almost quite smooth.

Books Presented.

Journal of the Bombay Branch Royal Asiatic Society. No. XI. From the Society.
The Horticultural Magazine, and Gardener and Practical Florist. Part XLVII. From the Publisher.
The Athenæum for October. From the Editor.
Proceedings of the American Philosophical Society, Vol. V., No. 40. From the Society.
A Hand-book of British Ferns; intended as a guide and companion in Fern Culture, &c. By Thomas Moore. From the Author.
Dritter Jahresbericht und Mittheilungen des Gartenbau Vereins für Neuvorpommern und Rügen. From the Society.

December 5, 1848. (Regent Street.)

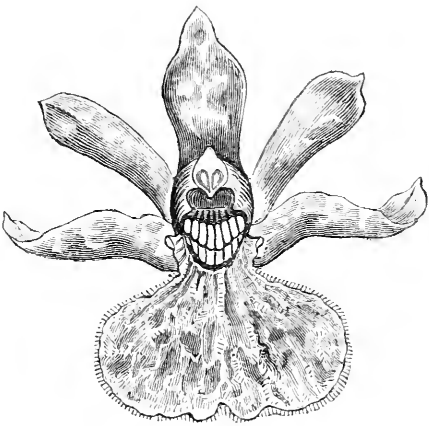
Various alterations in the by-laws were read for the second time by order of the Council, as directed by the Charter, and then suspended in the meeting-room.

Elections. The Marquess of Ormonde, and Joseph H. Barchard, Esq., of Putney Heath.

Awards. *Banksian Medal:* To Mr. Roberts, gardener to the Duke of Cleveland, at Raby Castle, Durham, for an exhibition of Grapes, consisting of two bunches of West's St. Peter, beautifully coloured, weighing respectively 1 lb. $10\frac{1}{2}$ oz., and 1 lb. 12 oz.; a bunch of the Syrian, weighing 2 lbs. 6 oz.; one of Escheolata Muscat, 1 lb. 3 oz.; and one of Cannon Hall Muscat, weighing 14 oz. These were stated by Mr. Roberts to have been sent, not as superior specimens of cultivation, but as samples of good table-fruit. "The two bunches of Black Grapes," he added, "are the true West's St. Peter, from the first year's wood of my young vines grown under 'the detestable' British sheet-glass. The White Grapes are not half so well coloured as they were last season, which is owing to the long dull autumn we have just passed over. The Escheolata Muscat, which resembles the Syrian, has no properties to recommend it, except such as belong to the Syrian, viz., that it will carry any weight of fruit, and that it hangs well and late."

Certificates of Merit: To the Gardener of E. J. Cooper, Esq., for a collection of Citrus Fruit, from the Orangery at Markree Castle, in the county of Sligo. The varieties were as follows:—1. *Citrus Rissoi*, a new variety, discovered by the late M. Risso, of Nice Maritime; this fruit has been grown in the Orangery, at Markree, to the size of $23\frac{1}{2}$ inches in circumference. 2. *Citrus Gordon*, named by the same botanist in compliment to the present Earl of Aberdeen, also a new variety; this is an average specimen as to size. 3. *C. Bigaradia longiflora*, the largest fruit

hitherto grown on this plant. 4. *C. Aurantium hierochunticum*, average sized fruit. 5. *C. Aurantium Nicæense*, the common sweet Orange of the province of Nice; average size. 6. *C. Bigaradia duplex*, average size. 7. *C. Limetta*, the only fruit that has yet come to perfection on this tree. 8. *C. Mellarosa*, under the average size; this is the most valuable of the varieties, it being highly perfumed, and making a most delicious preserve. There are, in the Orangery at Markree Castle, twenty-five varieties of Oranges, Lemons, and Citrons, which were selected and named by the late M. Risso for Mr. Cooper, and were imported by him from Nice a few years ago. The trees are all planted in beds, and are in the most flourishing condition. To Mr. Ivison, gardener to the Duchess Dowager of Northumberland, for fruit of Jambosa vulgaris, the Yellow Rose Apple, gathered from a plant in the Conservatory at Syon House, which was stated to have at one time on it not fewer than 100 fruit. This is a small, oblong, pale yellow fruit, containing two large round seeds, and having the flavour of one of the Alberge Apricots, with an addition of Roses. To the same, for fruit of a plant, the seeds of which were received from Captain Herbert in 1840, and marked " Tree Tomato, of Chili, a valuable fruiting shrub, excellent for Jellies." The fruit was the size and form of a pigeon's egg, of a rich brownish red colour, filled with a purplish subacid pulp, very agreeable to the taste. The leaves are large, broad, heart-shaped, downy, and emitted a



Zygopetalum brachypetalum.

very heavy unpleasant smell. The plant is some Solanum, allied to S. betaceum, if not the same. To Mr. Bassett, gardener to R. S. Holford, Esq., F.H.S., for one of the best of the many varieties of Vanda suavis. To M. de Jonghe, of Brussels, for Zygopetalum brachypetalum. This species was originally brought into notice by Mr. Waterhouse, of Halifax, in the year 1840, and is little known. It is one of the handsomest of the species, having brownish sepals and petals, a little marbled with green, and a deep bluish-violet lip veined with white. The crest of the lip is clearly striped with blue, and the column is streaked with dull dark purple. M. de Jonghe stated that it had been found by his collector Libon, in 1847, on the Peak of Itabiri, in the province of Minas, in Brazil. To Mr. Dobson, gardener to Mr. Beck, F.H.S., for a small collection of Orchids, especially for an Oncidium unguiculatum. To Mr. Cole, gardener to H. Colyer, Esq., Dartford, Kent, for a bundle of Cole's Superb Red Solid Celery, six heads of which weighed each 6 lbs. 8 oz.; and for an excellent paper, explaining his mode of management, which is published in the present volume of the Journal.

Miscellaneous Subjects of Exhibition. Cut specimens, in a pot, of Fuchsia spectabilis, from Messrs. Veitch, who stated that "they were taken from a plant which is growing most luxuriantly in the border of their Conservatory, where it has been in full flower for these last three months, having on it from twenty to thirty bunches of blossom, and being the admiration of all who have seen it." Mr. Spall, gardener to W. Carbonell, Esq., of Westbourne Green, Harrow Road, sent a plant of the White Persian Cyclamen (C. Persicum album). Mr. Kendall, of Stoke Newington, a small collection of plants from his Polmaise Stove. Among these were two specimens of Torenia asiatica, which has been stated by some to be a greenhouse plant. Mr. Kendall, however, considers that it can only be safely wintered in a stove. He says that if it is treated as "a greenhouse plant during the winter months, in nine cases out of ten it will prove a source of disappointment. It is extremely susceptible of cold, particularly if accompanied by damp dull weather. Last winter I lost every plant, and such is already the case this year with all those treated as greenhouse plants; and my case is not an isolated one, for I have many complaints of a similar kind. The two plants exhibited were struck late in the spring, and were treated as greenhouse plants during the summer, blooming continu-

ously. Early in October they were placed in my Polmaise Stove, where they have continued to flower freely, and promise fair to do so throughout the winter." With this came a Seedling Cineraria, named 'Queen of the Isles,' concerning which Mr. Kendall stated that the plant shown was a Cutting from a Seedling of the present year, and that it had never been out of doors at all, but kept in his Polmaise Stove. Early in October it was subjected to a high temperature, being placed side by side with the Torenias in a minimum heat of 76° by day, and 60° by night, proving beyond a doubt that the Cineraria may be successfully forced into as fine a bloom at the present season as Nature herself can display during the more favourable months of spring. The Rev. C. Mackie, Rector of Quarley, Hants, communicated specimens of a Seedling Apple, which had been raised by Mr. Collins, Blacksmith, Upper Chatford, in the same county, in the year 1832. He (Mr. Mackie) stated that "the tree bore this year ten gallons of Apples, almost the whole of which were equal to, and many, I am told, much superior to those I have sent, as he selected the best to present to a gentleman in the neighbourhood, whose admiration had been raised by seeing so much beautiful fruit upon so small a tree. These Mr. Collins had parted with before I had an opportunity of suggesting to him the sending specimens for the Society's inspection. Having put it to the test, I can vouch for its being a very valuable fruit for baking, exceedingly well flavoured, and of a beautiful colour when dressed." It is a Pearmain-shaped Apple, resembling the Herefordshire Pearmain. Finally, from Mr. Smith, Enameller, Berkeley Street, Clerkenwell, came samples of Enamelled Garden Labels. They were light and very neat looking, but had the appearance of being brittle.

NOVELTIES FROM THE SOCIETY'S GARDEN. Whitfieldia lateritia, and Clerodendron Hugelii, the latter forming a small tree covered with clusters of whitish flowers. It is a distinct looking species, possessing little merit beyond novelty. The following Apples were exhibited from the Garden :—

1. Bedfordshire Foundling, one of the best kitchen apples, or it may be used for dessert; the tree is vigorous, bears abundantly when old, but to make it bear when young it requires summer-pruning.

2. Boston Russet, an excellent dessert-fruit; the best of all the American varieties for this climate.

3. Braddick's Nonpareil, a great bearer, far exceeding the Old Nonpareil in this respect, and approaching it in flavour.
4. Pearson's Plate: in a good season this is richly coloured, and is one of the handsomest dessert-apples; excellent in quality.
5. Cockle Pippin, an abundant bearer, and a good late dessert-fruit.
6. Screveton Golden Pippin: the fruit of this is more russeted than that of the Old Golden Pippin, to which, in quality, it is similar. Those who esteem the Old Golden Pippin—it may be asked, who does not?—and have an opportunity of cultivating apples, should substitute the Screveton Golden Pippin, because the tree is more healthy and a better bearer than the old variety.

BOOKS PRESENTED.

Flora Batava. Nos. CLIV. and CLV. From His Majesty the King of Holland.
The Athenæum for November. From the Editor.
The Quarterly Journal of the Geological Society. No. XVI. From the Society.
The Florist. Vol. 1. From Mr. Beck.

January 16, 1849. (REGENT STREET.)

The new by-laws, which had been read at two previous meetings, and suspended in the meeting-room, were again read. The meeting then proceeded to ballot for the repeal of the old by-laws. The Vice-President, in the chair, announced the repeal to be carried unanimously. A ballot then took place for the new by-laws, which were carried unanimously. The Vice-President then declared them to be passed according to the provisions of the Charter, and to be the future laws of the Society.

ELECTIONS. George Beauchamp Cole, Esq., Heatham Lodge, Twickenham; and George Thomas Davy, Esq., Sussex Square, Hyde Park.

AWARDS. *Knightian Medal.*—To Mr. Davies, gardener to Lord Bridport, for a plant in a pot of Black Jamaica Pine-apple, bearing three suckers, each ripening off a fruit which could not have weighed less than between 3 and 4 lbs. It was stated that Mr. Davies grows his pines on the Hamiltonian system; but that instead of planting them out in the bed of the pine pit, as Mr. Hamilton mostly does, he cultivates them in pots, which obviates the principal objection to the system, that of having the fruit all ripe at one time.

Two ripe fruit had been cut on the 28th of February, 1848, from the plant exhibited; one of these weighed 4 lbs. 8 oz., the other 4 lbs. 10 oz. The old stem was then cut down, and the suckers which the plant had thrown out produced the fruit shown; the plant had not been shifted for a period of two years.

Banksian Medals: To Mr. Davis, of Oak Hill, East Barnet, for a dish of West's St. Peter's Grapes, not large either in bunch or berry, but perfectly ripened and beautifully coloured. To Mr. Tucker, gardener to J. Moorman, Esq., of Clapham Road, for a collection of Pears, consisting of Glout Morceau, Beurré d'Aremberg, Winter Nelis, Napoleon, Easter Beurré, Beurré Diel, and Ne Plus Meuris, all in a most excellent state of preservation. The published reports of the Society's meetings show that Mr. Moorman has for years past sent a similar collection of fruit about the same season, and always in the same condition—plump and sound as when removed from the trees. His mode of keeping his fruit, however, remains a mystery.

Certificates of Merit: To Mr. Bevington, gardener to Mark Philips, Esq., F.H.S., for two sorts of unknown Grapes, called Black and White Barbarossa. They had been received from the Continent along with other kinds, all of which proved worthless except those exhibited. The Black sort was large both in bunch and berry; it weighed 2 lbs. 9 oz.; it was stated to be a good bearer, and to surpass anything in the part of the country from which it came for keeping on the vines without losing flavour or sinking in the size of the berry. It, however, proved inferior in flavour to the West's St. Peter's, to which Mr. Philips considers it superior in keeping qualities. The White variety looked like a Muscat, but it had none of the Muscat flavour; it weighed 14½ oz. To Mr. Glendinning, F.H.S., Chiswick Nursery, for cut specimens of forcing Pelargoniums, exhibiting some improvement in point of colour on the kinds usually employed for that purpose. Among them was a scarlet, very bright, and stated to stand heat without shedding its flowers. To C. Rankin, Esq., F.H.S., Dulwich, for three handsomely swelled Citrons from a greenhouse.

Miscellaneous Subjects of Exhibition. A plant of Sericographis Ghiesbreghtiana, figured at p. 245, vol. iii. part iii., from Messrs. Henderson, of Pine-apple Place. A Cayenne Pine-apple weighing 4 lbs., the produce of a plant twenty months from the Gill, from Mr. Wright, gardener to Mrs. Rushout, F.H.S., Wanstead. A box of Ash-leaf

kidney Potatoes, sprung and ready for planting, from Mr. Cuthill, of Camberwell. These latter were sent to prove by the strength of their shoots the fallacy of the opinion entertained by some, that small potatoes will not produce so good a crop as large tubers. Mr. Cuthill is of opinion that they will, and in this, it was mentioned, he is borne out by a series of experiments which had been tried in the Society's Garden some sixteen years ago, the result of which was that the small sets yielded as good a crop as large ones. Mr. Wilmot, F.H.S., Isleworth, sent an impression of a Vine-leaf measuring 21 inches the one way and 18 inches the other. The history of the vines which produced the leaves, of which this impression was an example, is as follows. From time to time Mr. Wilmot had collected a great number of what were given out as varieties of Black Hamburgh, and, in order to prove them without loss of time, he planted them, two years ago last June, at the back of two of his low pine-houses, extracting a brick out of the wall for each vine, and introducing their points into the houses. Two houses 90 feet long were so planted on the same day, and under precisely the same circumstances; in fact both houses were planted in less than two hours. The object Mr. Wilmot had in view being merely to get a bunch or two off each vine, in order to ascertain their relative merits, instead of an expensive border being prepared, a hole was dug with a mattock and spade barely sufficient to receive the ball when turned out of the pot. This hole was made in the hard beaten path, which is composed principally of clinkers, cinders, and gravel. The vines grew away immediately, and fruited well the following year in the temperature of the pine-stove, all proving, as was expected, to be one and the same kind of Hamburgh. Last October one of the pits began to break. The other (January 9) is now in about the same stage of forwardness as the other was in October. The foliage is generally of the size mentioned, and the vines are altogether very vigorous, bearing a capital crop, half swelled, and which will ripen by the end of February. When the manner of planting the vines, the quality of the border, and the season at which such foliage has been developed, are taken into account, the whole matter proved inexplicable to Mr. Wilmot, who, with all his experience, was unable to account for it. From Mr. Roberts, of Eastcheap, came some wire guards, or flower supporters, and specimens of earthenware pipes split in two, which fitted into sockets also split, for putting round plants, more especially strawberries, with a view to keeping their fruit clean.

"Hitherto," says Mr. Roberts, "it has been a complaint with all gardeners that they cannot keep the fruit free from dirt in wet weather; I purpose by my method to prevent complaints in future, and at the same time to succour the plants and improve the quality of the fruit, by means of my Double Tile and Socket, which, when placed around the plant, will keep it free from dirt, shade the surrounding earth from the sun, thereby causing it to require less water, and preventing the growth of weeds. The heat absorbed by day will nourish the plant at night, and tend to produce fruit much finer and earlier. The tiles are placed on feet to allow the wet to run under them; and should the plants grow so large as to overhang the tiles, they can be kept in their places by means of a small socket. The expense is so trivial, compared with the durability and saving of labour, that I am induced to hope that every grower of strawberries who wishes to have fine clean fruit will avail himself of the tiles.

"Celery can be grown in the highest state of perfection by means of the tiles and sockets, which sockets are made from 4 inches to 2 feet high; the celery by the same means, therefore, will require no earthing up, and will be quite free from dirt, and beautifully white. Lettuce, likewise, is much improved in size and quality with less labour than usual. Plants also, which have a tendency to ramble, can be confined within the required limits, and the different kinds much improved by means of tiles suitably made; and such flowers and plants as grow high, and require to be tied up, can be more readily supported, and more economically attended to, by my improved flower supporter, than any other means (durability and labour considered). The improvement consists in the supporter being divided into two halves or parts, enabling the gardener to place it round a flower instead of over it, thereby preventing breakage. The same kind of supporter is adapted for hyacinths; it can be applied at any stage of growth, and the hyacinth can be removed from the glass without injury."

NOVELTIES FROM THE SOCIETY'S GARDEN. A pale variety of Gesnera Douglasii, and a healthy well-flowered specimen of Sericographis Ghiesbreghtiana. This latter promises fair to become one of our very handsomest winter flowering stove plants, the deep green leaves setting off the bright scarlet flowers, which remain long in perfection, to advantage.

The Chairman (J. J. Blandy, Esq.) drew attention to the great loss which the Society had sustained by the death of the Earl of Auckland, who had for many years been a most active member of the Council, and he announced that the next meeting would be made special for the purpose of electing a successor to his Lordship. Mr. Hutton, on the part of the Council, expressed their deep sense of the valuable services which had been rendered to the Society by the deceased nobleman, who might be truly described as one of the most able, useful, and sincere friends which Horticulture had ever possessed.

Books Presented.

The Journal of the Royal Agricultural Society of England. Vol. IX., Part 2. From the Society.
The Athenæum for December. From the Editor.
The Journal of the Royal Geographical Society. Vol. XVIII., Part 2. From the Society.
Le Bon Jardinier, Almanach pour 1849. From M. Vilmorin.
Philosophical Transactions of the Royal Society of London: for the year 1846, Parts 2, 3, and 4; for the year 1847, Parts 1 and 2; for the year 1848, Part 1. Proceedings of the Royal Society, Nos. 62 to 70 inclusive. Address of the President read on the 9th of June, 1848, and a List of the Fellows. From the Royal Society.

The By-laws passed on this occasion are printed in the following pages.

BY-LAWS

OF THE

HORTICULTURAL SOCIETY OF LONDON,

As confirmed at a General Meeting of the Society held on the 16th of January, 1849.

CHAPTER I.

By-Laws.

THE Council may from time to time vary, alter, or revoke By-Laws, and make such other By-Laws as they may think useful and expedient; but in order to be valid, such By-Laws must have been hung up in the common meeting-room and been read by the President (or any one of the Vice-Presidents) at two successive general meetings, and been confirmed by ballot by the Fellows at the general meeting next after two such successive general meetings, two-thirds of the Fellows present voting for the same.

CHAPTER II.

Election and Admission of Fellows.

ARTICLE I. Every candidate for admission into the Society, as a Fellow, must be proposed by three or more Fellows, who must sign a certificate in recommendation of him.

ART. II. The certificate must set forth the names, description, and place of residence of the candidate, and state that he is desirous of becoming a Fellow.

Art. III. The proposer whose name stands first upon the certificate must have personal knowledge of the candidate, or his writings, and must certify to that effect upon the certificate.

Art. IV. The certificate, when duly filled up, must be delivered at the house of the Society, addressed to the Secretary. It shall be read at the two next ordinary general meetings, and suspended in one of the rooms of the Society during the intervals between those meetings, and the person therein recommended shall be balloted for at the next ordinary general meeting; and to constitute a valid election, not less than seven Fellows must be present, and not less than two-thirds of those present must vote in favour of the candidate proposed.

Art. V. Royal Personages, Peers of Great Britain, Scotland, or Ireland, Privy Councillors, Peeresses in their own right, and the eldest sons, wives, widows, and daughters of Peers, may be balloted for and elected Fellows of the Society at the same ordinary general meeting at which they are proposed, and on the recommendation of a single Fellow.

Art. VI. Persons whose certificates shall have been signed by the Chairman of the Council, on the part of the Council, may also be balloted for and elected Fellows at the same general meeting at which they are proposed.

Art. VII. The Secretary shall address to every person elected a Fellow, on the day after his election, a printed copy of the letter (No. I. in the Appendix) and of the obligation (No. II. in the Appendix).

Art. VIII. As soon as the person so elected shall have paid his admission fee and shall have returned the obligation, signed by himself, and addressed to the Secretary at the house of the Society, he shall then be entitled to exercise all the privileges of a Fellow; and his name shall be entered in the lists of the Society.

CHAPTER III.

Withdrawing, Removal, and Re-admission of Fellows.

Art. I. Any Fellow, or Member, or Associate, may withdraw from the Society by signifying his wish to do so, by letter, under his own hand, addressed to the President at the house of the Society: provided always that such Fellow, or Member, or Associate, shall be liable to the contribution of the whole year wherein he signifies his wish to withdraw; and that he shall continue liable to the annual contribution until he shall have discharged all sums, if any, due from him to the Society, and shall have returned all books, or other property, if any, borrowed by him of the Society; or shall have made full compensation for the same, if lost or not forthcoming.

Art. II. Whenever written notice of a motion to be submitted to a general meeting, for removing any Fellow, or Member, or Associate, from the Society, signed by the Chairman, for the time being, of the Council, on the part of the Council, or by any five or more Fellows, shall have been delivered to the Secretary, such notice shall be read from the chair at the two successive ordinary general meetings next following the delivery thereof; and at the next ordinary general meeting such motion shall be taken into consideration, and decided by method of ballot; whereat if seven or more Fellows shall ballot, and two-thirds of the Fellows balloting shall vote that such Fellow be removed, he shall be removed from the Society.

Art. III. The Fellow so withdrawn or removed shall not be entitled to exercise any of the privileges of a Fellow from the day of his withdrawal or removal.

Art. IV. The Council shall, at any time after the resignation of any Fellow, have the power upon special cause to them shown to order the re-admission of such Fellow into the Society.

Art. V. The Fellow so re-admitted shall again sign the

aforesaid obligation, and shall thenceforth be entitled to all the privileges of a Fellow without the payment of any other admission fee.

Art. VI. In case of any Fellow going to reside abroad for any number of years, and giving due notice of such his intention in a letter addressed to the Secretary at the house of the Society, the Council shall have power to release him from all payments to the Society accruing due during the time of his residence abroad, provided that during such absence he enjoy none of the rights and privileges of a Fellow.

CHAPTER IV.

Payments to be made by the Fellows.

Art. I. The admission fee to be paid by each Fellow shall be six guineas.

Art. II. The annual contributions to be paid by the Fellows shall be four guineas; with the exception of those elected before the 1st of October, 1818, who shall pay two guineas; and of those after the 1st of October, 1818, and before the 1st of May, 1822, who shall pay three guineas.

Art. III. Each Fellow elected before the 1st of May, 1822, who has become an annual subscriber of one guinea to the Garden, shall continue to be liable to the payment of such annual subscription so long as he shall continue a Fellow of the Society.

Art. IV. If the Council shall hereafter think fit to create a class of Associates with fewer privileges than Fellows, the Council is empowered to fix for such Associates such admission fee and privileges and annual subscription as the Council may think expedient; such Associates to be elected in the same manner as Fellows.

Art. V. All annual contributions shall become due and payable on the day of the anniversary meeting in each year for the year preceding.

ART. VI. Every newly elected Fellow, if elected in the months of May or June, shall be subject to the annual contribution for the current year; but if elected in any subsequent month, he shall be subject to a part only of such contribution, to be computed from the day of his election to the 1st of May next ensuing, at the rate of one guinea for every three months.

ART. VII. Every person who shall cease to be a Fellow or Associate of the Society, or whose payments shall have been suspended as herein provided, after the 1st day of May in any year, shall be liable to the payment of his subscription for that year.

ART. VIII. Every Fellow may at any time compound for all his future annual contributions by paying ten times the amount of his annual subscription.

ART. IX. All arrears of subscriptions and payments which shall not have been paid within six months after they become due shall be reported from time to time by the Treasurer to the Council, and the names of all Fellows in arrear more than twelve months, with the amount of each arrear, shall be hung up in the library, and upon every day of meeting in the general meeting-room of the Society, and the Treasurer shall take such measures as may by the Council be deemed expedient and necessary for the recovery thereof.

CHAPTER V.

Funds and Property of the Society.

The funds and property, and all accretions of and additions to the same, shall be exclusively employed, under the direction of the Council, in promoting the objects and purposes for which the Society was incorporated; and no dividend, gift, division, or bonus in money or otherwise shall under any circumstances whatever be made unto or between any of its Fellows or Members.

CHAPTER VI.

Rights and Privileges of Fellows.

ART. I. The Fellows of the Society shall be entitled to the following rights and privileges:

To be present and vote at all general meetings.

To introduce visitors at the ordinary general meetings of the Society.

To have personal access to the library and other public rooms of the Society, and there to consult the printed books, plates, and drawings belonging to the Society.

To have personal admission, and to introduce personally or by order visitors to the Garden of the Society.

To receive gratis the publications of the Society which may appear during the time they continue to be Fellows.

To purchase the publications or Journal of the Society at reduced prices.

To participate in the Society's distributions of seeds, cuttings, and plants.

To purchase at a reduced price tickets for the Exhibitions in the Garden, with such limitations or under such regulations as the Council may from time to time direct.

To recommend young men for employment in the Society's Garden.

ART. II. Any Fellow of the Society may at any time inspect the books of account of the Society, on giving one full day's notice of his intention so to do to the Secretary or to the Accountant at the house of the Society.

ART. III. The wife or sister of a Fellow shall have the privilege of free admission to the meetings of the Society in Regent Street, personally and with friends; and also to the Garden, when open, except on days of exhibition, or the day immediately preceding such days.

ART. IV. No Fellow who is more than one year in arrear of his annual contributions shall be entitled to vote at any elec-

tion or meeting of the Society, or to exercise any of the rights or privileges of a Fellow.

Art. V. The exercise of these and all other privileges shall be subject to such regulations as the Council may from time to time deem expedient to make.

CHAPTER VII.

Ladies Fellows of the Society.

Art. I. Ladies may be admitted as Fellows of the Society. They shall be elected and admitted in the same manner, entitled to the same rights and privileges, and subject to the same payments, obligations, and other regulations as the ordinary Fellows of the Society.

Art. II. Every lady, Fellow of the Society, may appoint any gentleman, being a Fellow of the Society, to vote for her at the general meetings of the Society, upon the production of a proxy written in the form given in the Appendix No. V., which proxy shall not be changed more than once in each year.

Art. III. If any lady, Fellow of the Society, shall be the wife of any person not a Fellow of the Society, he shall not be entitled in her right to any of the rights or privileges of a Fellow, but she shall, so long as she continues to conform to the regulations of the Society, continue to enjoy all her rights and privileges as a Fellow of the Society.

Art. IV. The exercise of these and all other privileges shall be subject to such regulations as the Council may from time to time deem expedient to make.

CHAPTER VIII.

Honorary Members.

Art. I. The number of honorary members shall not at any time exceed five.

Art. II. When the number of honorary members shall not be full, the Council shall have power to nominate a candidate, who shall be balloted for at the next ensuing ordinary general meeting.

Art. III. Honorary members shall be exempted from the payment of any admission fee or annual contribution.

Art. IV. Honorary members shall be required to sign the obligation, and shall thereupon become entitled to all the privileges of the ordinary Fellows.

Art. V. They shall also be subject to the same obligations and other regulations as the ordinary Fellows, except as herein expressly provided.

CHAPTER IX.

Foreign Members.

Art. I. The number of foreign members shall not at any time exceed twenty.

Art. II. They shall consist of persons distinguished for having rendered important service in promoting the progress of Horticultural knowledge.

Art. III. When the number of foreign members shall not be full, the Council shall have power to nominate a candidate, (on stating the services he has rendered to the Society or to Horticultural science,) who shall be balloted for at the next ensuing ordinary general meeting.

Art. IV. Foreign members shall be exempted from the payment of any admission fee or annual contribution.

Art. V. There shall be transmitted to each foreign member, as soon as may be after his election, a diploma of his appointment in the Latin language, under the common seal of the Society.

Art. VI. Upon receiving such diploma, the foreign member shall become entitled to the following rights and privileges:

To be present at all general meetings.

To have personal access to the library and other public rooms of the Society, and there to consult the printed books, plates, and drawings belonging to the Society.

To have personal admission to the Garden of the Society, and to issue orders for the admission of others.

To receive the Transactions of the Society published during the time he continues to be a member.

ART. VII. Foreign members shall not be entitled to propose candidates, or to vote at general meetings, or to fill any office in the Society.

ART. VIII. The exercise of these and all other privileges shall be subject to such regulations as the Council may from time to time deem expedient to make.

CHAPTER X.

Corresponding Members.

ART. I. The Council shall have power to recommend such persons as they think fit (if likely to render the Society efficient services) to be corresponding members of the Society, who may be balloted for at the same ordinary general meeting at which they are so recommended.

ART. II. Corresponding members shall be exempted from the payment of any admission fee or annual contribution to the Society.

ART. III. There shall be transmitted to each corresponding member, as soon as may be after his election, a diploma of his appointment in the English language, under the common seal of the Society.

ART. IV. Upon the receipt of such diploma, the corresponding member shall be entitled to be present at general meetings, and to have personal admission to the Garden, but to no other rights or privileges.

ART. V. The exercise of these and all other privileges

shall be subject to such regulations as the Council may from time to time deem expedient to make.

CHAPTER XI.

General Meetings.

Art. I. No general meeting of the Fellows shall be competent to conclude any business unless seven or more Fellows be present.

Art. II. The President shall be the chairman at all general meetings; or in case of his absence, one of the Vice-Presidents; or in case of their absence, one of the members of the Council; or in case of the absence of all the members of the Council, a Fellow to be appointed for the occasion.

Art. III. The ordinary method of voting shall be by show of hands, but a ballot shall be taken in cases prescribed by the charter or by-laws, or when demanded by any Fellow present.

Art. IV. The decision of the majority of the Fellows voting at a meeting shall be considered as the decision of such meeting; and an absolute majority shall suffice, except in cases specially designated by the charter or by-laws.

Art. V. When the votes on either side shall be equal, except in cases specially designated by the charter or by-laws, the chairman shall give a casting vote.

Art. VI. If the adjournment of any question has been put and carried, an adjournment may be made of any general meeting; but no business shall be transacted at any adjourned meeting, other than such as was proposed to have been transacted at the meeting from which the adjournment was made.

Art. VII. Minutes of the proceedings of every general meeting shall be taken during their progress by one of the Secretaries; or in case of the absence of the Secretaries, by some Fellow whom the chairman of the meeting shall appoint for the occasion. The minutes shall afterwards be fairly

copied into a minute-book, and at the next meeting shall be read aloud by one of the Secretaries for confirmation, and, if confirmed, such confirmation shall be certified by the chairman affixing his signature thereto.

Art. VIII. The general meetings to be held by the Society shall be of three kinds: 1st. The anniversary meeting; 2nd. Special; and 3rd. Ordinary meetings.

CHAPTER XII.

Anniversary Meeting.

Art. I. The anniversary meeting for the election of members of Council and officers shall be held on the 1st of May, or if that day be Sunday, on the day following, and shall consist of eleven or more Fellows.

Art. II. Notice of the meeting shall be sent by post to every Fellow residing within the limits of the Metropolitan post delivery for the time being, whose place of residence is known, and shall be inserted in two or more public newspapers, one week at least before the day of meeting.

Art. III. The Council for the time being shall, before the day of election, cause to be prepared a sufficient number of printed balloting lists, according to the forms in the Appendix; one of which (No. 3) is to contain the names of such persons as they shall recommend to be removed from, and elected into, the Council; and the other (No. 4) is to contain the names of such persons as they shall recommend to fill the offices of President, Treasurer, Secretary, and Auditors for the ensuing year.

Art. IV. On the day of election the chairman shall take the chair precisely at one o'clock P.M., and shall, as soon after that hour as eleven or more members shall be present, open the business of the day, by naming and appointing two of the members present as Scrutineers, to superintend the ballot for

choosing the above-mentioned Council and officers, and to report to him the result of the ballot. A Report of the Council on the proceedings of the Society during the year immediately preceding shall then be read, as also the Auditors' Report for the preceding year. After such Reports shall have been read and considered, other business, if any, may be proceeded with. The ballot for the choice of the Council and officers shall commence, at the latest, one hour after the chair shall have been taken, and shall be continued afterwards for as long a time as the chairman shall deem sufficient to afford to the members present at the meeting the opportunity of voting. During the ballot the meeting may proceed with the other business, if any, which may remain to be transacted. As soon after the closing of the ballot as the Scrutineers shall be prepared to report, all other business whatsoever shall be suspended; whereupon they shall first declare to the meeting the result of the ballot for the Council, and afterwards the result of that for the officers. After such declaration the meeting may proceed with other business.

Art. V. If any list shall contain more than the proper number of names, or if any list for officers should include the name of any person who is not a member of the Council, such list shall be deemed void, and not taken any account of by the Scrutineers in casting up the number of votes.

Art. VI. In case there shall be an equal number of votes for the removal from the Council, or for the election into the Council or to any of the respective offices, of two or more persons, the order of preference shall be decided by the casting vote of the Chairman.

Art. VII. If at the time of closing the ballot for the election of the members of the Council it shall appear that eleven Fellows have not balloted, the anniversary meeting shall be adjourned to some other day not less than a week nor more than two weeks after such original meeting.

Art. VIII. Notice of such adjourned meeting shall be given,

and the business shall be transacted in the manner prescribed in the preceding articles of this chapter; and the Council and officers elected on the preceding anniversary shall continue to conduct the affairs of the Society until their successors are elected.

CHAPTER XIII.

Special General Meetings.

ART. I. Special general meetings of the Fellows may be held from time to time, as there may be occasion, for the purpose of taking special matters, relating to the business of the Society, into consideration.

ART. II. A week's notice, at least, of the time when, and the object for which, every special meeting is to be holden, shall be given to every Fellow living within the limits of the metropolitan post delivery.

ART. III. No other business than that of which notice has been given in the summons for convening the meeting shall be entered upon or discussed at such meeting.

ART. IV. A special general meeting shall be convened within a reasonable time after a requisition to that effect, specifying the business for which the meeting is to be convened, and signed by the chairman of the Council on the part of the Council, or by any five or more Fellows, shall have been delivered, addressed to the Secretary at the house of the Society. Provided that no special general meeting shall be held during the recess of Parliament, unless at the desire of the Council.

ART. V. In case of the death or resignation of any of the officers of the Society, or of any other member of the Council, in the interval between any two successive anniversary meetings, a special general meeting shall be held within two months next after such death or resignation, or as near thereto as conveniently may be, for the purpose of filling up the vacancy: and the summons for such meeting and the proceedings thereat

shall, as far as circumstances will admit, be after the manner directed for the anniversary meeting.

Art. VI. A special general meeting, convened as herein provided, may be holden on any one of the days appointed for the ordinary general meetings, in which case the special business shall be entered upon immediately after the ordinary business of the day is closed.

CHAPTER XIV.

Ordinary General Meetings.

Art. I. The ordinary general meetings shall be held on such days of such months as the Council may determine from time to time. Notice of the days of such meetings for the ensuing year to be sent by post to all Fellows on or before the 1st of November in each year.

Art. II. Persons not belonging to the Society, if introduced by Fellows or foreign members, may be present at the ordinary general meetings. Their names shall be inserted in a book, with the names of the persons who introduced them.

Art. III. At the ordinary general meetings the order of business shall be as follows:

1. The minutes of the last meeting shall be read, and, if confirmed by the meeting, signed by the chairman.
2. The presents made to the Society, since their last meeting, shall be announced and exhibited.
3. Candidates for admission into the Society shall be balloted for.
4. Papers and communications shall be read.
5. Fruits, flowers, &c. shall be exhibited.
6. Recommendations of candidates for ballot shall be read.

Art. IV. No motion relating to the government of the Society, its by-laws, the management of its concerns, or the election, appointment, or removal of its officers and servants, shall be made at any ordinary general meeting: nor shall any

business relating thereto be transacted at any such meeting, except in so far as the charter or by-laws may expressly enjoin or permit.

CHAPTER XV.

Council and Officers.

Art. I. The Council shall consist of fifteen members elected from amongst the Fellows. The officers, viz. the President, four Vice-Presidents, Treasurer, and Secretary, shall be chosen from amongst the Council.

Art. II. The President, Secretary, or any three members of the Council, may at any time call a meeting of the Council.

Art. III. When a meeting of the Council is to be holden, every member of the Council shall be summoned by letter; and such meeting, having been duly summoned, shall be competent to carry into execution all the powers intrusted to it by the charter and by-laws.

Art. IV. No meeting of the members of the Council shall be competent to conclude any business (except alterations in by-laws, when three are sufficient), unless five or more members be present.

Art. V. The President shall be the chairman of all meetings of the Council; or in case of his absence, one of the Vice-Presidents; or in case of their absence, the senior member of the Council.

Art. VI. The ordinary method of voting at the Council shall be by show of hands; but a ballot shall be taken in cases prescribed by any regulations of the Council, or when demanded by any member present.

Art. VII. The decision of the majority of members voting at a meeting shall be considered as the decision of the meeting, and the chairman shall be entitled to vote, and if the votes on either side be equal he shall give a casting vote.

Art. VIII. Minutes of the proceedings of every meeting of

the Council shall be taken during their progress by the Secretary, or, in case of his absence, by some member present, whom the chairman shall appoint for the occasion: the minutes shall afterwards be copied fairly into a minute-book to be kept for that purpose, and read and signed by the chairman at the next meeting of the Council.

Art. IX. The government of the Society, and the direction, management, and execution of its concerns, are intrusted to the Council, subject to no other restrictions than are and may be imposed by the charter and by-laws, and to no other interference than may arise from the acts of the Fellows in general or special meeting assembled.

Art. X. The accounts of the Society shall be regularly audited.

Art. XI. The Council shall present and cause to be read to the anniversary meeting a report on the general concerns of the Society for the preceding year; the report shall state the income and expenditure, the receipts and disbursements, the balance in hand, the debts and assets, and the increase or diminution of the property of the Society during that year.

Art. XII. The Council may appoint Committees to examine into, and report to them on, any special matters, scientific or otherwise, relating to the objects or concerns of the Society, and may require such Committees to report, and may dissolve such Committees, whensoever they shall think proper.

Art. XIII. It shall be the duty of the Treasurer,

To sign all drafts to be paid by the banker, and all receipts for the contributions of Fellows.

To see that the accounts of all receipts and payments made by or on account of the Society are regularly kept in such manner as to afford the means of ascertaining at any time the state of the affairs of the Society.

Art. XIV. The Treasurer shall not issue any draft for any sum above 5*l.* without the previous authority of the Council, excepting that he shall have power to issue drafts for the pay-

ments of all rents, rates, taxes, insurances, and salaries, as and when they shall become due, without the express authority of the Council for each payment, provided that the respective amounts of such payments, and the times of payments, shall have been previously fixed by the Council.

ART. XV. It shall be the duty of the Secretary,

To take down the minutes of the proceedings of the Council.

To transmit the orders of the Council to the salaried officers.

To conduct the correspondence of the Society.

ART. XVI. The offices of President, Vice-President, Treasurer, and Secretary shall be honorary.

ART. XVII. No person shall at the same time hold any two of the offices of President, Treasurer, and Secretary.

ART. XVIII. The Council shall from time to time determine the number, duties, and salaries of all salaried officers, gardeners, clerks, and other persons necessary for transacting the business of the Society.

CHAPTER XVI.

Publications of the Society.

ART. I. Every paper communicated to the Society for publication shall be deemed the property of the Society from the time of its being delivered at the house of the Society, unless any previous engagement to the contrary has been made with the author.

ART. II. The consideration of the papers to be selected for publication, and of the form in which, and the time when, they shall be published, shall be decided by the Council.

CHAPTER XVII.

Common Seal and Deeds.

Art. I. The charter, the common seal, and the deeds of the Society, shall be deposited in an iron chest, to be kept at the house of the Society.

Art. II. Every deed or writing to which the common seal is to be affixed shall be sealed at a meeting of the Council, and signed by the Chairman and four or more other members of the Council.

APPENDIX No. I.

Form of Letter to be written upon the Election of a Fellow.

Horticultural Society, 21, *Regent Street.*

[SIR,]

I have the honour of acquainting you that you have been this day elected a Fellow of the Horticultural Society of London, and that upon your returning to me the enclosed obligation, signed by yourself, and paying your admission fee of six guineas, your name will be inserted in the list of the Society, and you will be entitled to exercise all the rights and privileges of a Fellow.

I have the honour to be,

[Sir,]

Your most obedient Servant,

Secretary.

The yearly contribution is four guineas, payable by you on the 1st of May in each year for the year preceding. If you should choose to compound for all annual payments, the money now to be paid by you will be—

Admission fee	£6	6	0
Composition in lieu of annual payments .	42	0	0
	£48	6	0

APPENDIX No. II.

Form of Obligation to be subscribed by Fellows.

I [we] who have hereunto subscribed my name [our names], do hereby [severally] promise, that I [we] will endeavour to promote the interests of the Horticultural Society, and the

object for which the same was founded; and that I [we] will duly pay , observe the by-laws of the Society, and the rules and regulations which may from time to time be established under the authority of the same, for the government of the Society, as long as I [we] continue a Fellow [Fellows] thereof.

Dated this day of , 18 .

APPENDIX No. III.

Form of Balloting List for the Council.

Three members of the present Council recommended to be removed from the said Council at the Election on the of , 18 .

A. B.	
C. D.	
E. F.	

Three members recommended to be elected in the Council.

L. M.	
N. O.	
P. Q.	

Any member who disapproves of any of the names recommended above is requested to strike out with his pen such names as he does not approve, and to write opposite to each name so struck out the name of the person for whom he chooses to give his vote.

APPENDIX No. IV.

Form of Balloting List for Officers.

A List of the persons recommended by the Council to be appointed to the offices of President, Treasurer, Secretary, and Auditors of the Society, at the Election on the of , 18 .

President,	A. B.	President.
Treasurer,	C. D.	Treasurer.
Secretary,	E. F.	Secretary.
Auditors,	G. H. I. K. L. M.	

Any member who disapproves of any of the names recommended above is requested to strike out with his pen such names as he does not approve, and to write opposite to each name so struck out the name of the person for whom he chooses to give his vote.

APPENDIX No. V.

Form of Proxy to be signed by Ladies, Fellows of the Society.

I, *A. B.*, do hereby, on this day of , 18 , appoint *C. D.* to appear and vote for me at any meeting of the Horticultural Society at which Fellows are qualified to vote.

February 20, 1849. (REGENT STREET.)

AWARDS. *Knightian Medal:* To C. J. Darbishire, Esq., of Rivington, near Bolton, for a finely-flowered specimen in a pot of the Primula altaica of the Russian botanists, a scapeless species with beautiful orange-eyed purple flowers. It was stated by the Vice-Secretary to be quite new to gardens; and the account which Mr. Darbishire gives of its introduction is as follows. He says, "My friend Mr. Beck, of Isleworth, will place upon the table for exhibition to-day a specimen plant of what I believe to be an entirely new and beautiful variety of Primula, which I found on a late visit to Constantinople. It was growing on grassy land, which had recently been cleared of the brushwood, in the neighbourhood of Karak, a quarantine station on the Asiatic side of the Bosphorus near the mouth of the Black Sea. As it was Midsummer when I met with it, and being of course out of bloom, I had no reason to suppose it to be anything more than our common yellow primrose until it flowered in the following spring. I have since found it to be perfectly hardy, standing our winters well out of doors; but as it appears to have a disposition to flower very early, when we have only cold and wet weather (this season I have had a successive bloom from the end of October), I prefer taking the roots into the house at the latter end of the year; they then form a beautiful and useful ornament to the conservatory during a dark and dull season. Its rich and delicate colour, however, is not fully displayed except in the sunshine. When grown freely its foliage is very large and robust, it is a most profuse bloomer and possesses a slight but delicious fragrance."

Banksian Medals: To J. Allnutt, Esq., of Clapham, for a fine specimen of Camellia rosea Sasanqua, about 10 feet high and well flowered. To its appearance as a plant, it added another feature of interest. It is well known that when large masses of soil like that in which Camellias are grown get dry, it is difficult to water them all through on account of the water passing off speedily by the sides of the pots. To prevent this Mr. Allnutt inserts into the surface of the ball, some two or three inches from the side of the pot or tub, a hoop of zinc or other metal, which retains the water within its circumference, and compels it to pass down through the mass of soil instead of escaping by its side. It was stated that he practises this plan with all his large specimens, and with advantage not only to the plant, but with regard to saving time and labour. To Mr. Hamp,

gardener to James Thorne, Esq., of Mawbey House, South Lambeth, for a very fine bunch, perfectly ripe, of either Musa Chinensis or Cavendishii; but from its pale colour it was thought to be the Chinese variety. It weighed when cut 13 lbs. 10 oz. It was stated to be the produce of a plant two years old at the time it showed fruit, which was in August last. It had been ripened in a stove the temperature of which ranged between 50° and 60° Fahrenheit, for these last four months. The plant was grown in a tub, in soil composed of three-fourths sandy loam, and one fourth rotten dung, with plenty of drainage; the roots, however, protruded through the bottom and over the sides of the tub, and were permitted to range freely into the bark bed in which it was plunged; it occasionally received liquid manure during the summer.

Certificates of Merit: To Mr. W. P. Ayres, of Brooklands Nursery, Blackheath, for a nice specimen, about two feet high, of Boronia triphylla. "I exhibit," writes Mr. Ayres, "to-day a small specimen of *Boronia triphylla*, which I think may be very justly described as one of the most beautiful of early blooming greenhouse plants. This plant is one of two years' growth from a three-inch pot; it has been grown from February to October in each year in a strong moist stove heat, and has been wintered in an intermediate house. It will be perceived that the leaves are *less curled* than they are generally seen on this plant, and I think this may in some measure be the effect of the free treatment it has received. This would seem to teach us the necessity of resorting to experiment in order to determine the proper treatment of certain plants belonging to the same genus, and it also shows what very different management plants from the same country require to grow them in perfection. The soil it is growing in is Wimbledon peat, sand, and potsherds." To Mr. Dobson, gardener to Mr. Beck, F.H.S., for a nice collection of Orchids, consisting of a purple variety of Dendrobium pulchellum; Cyrtochilum maculatum, Oncidium lacerum, and Odontoglossum pulchellum. To Mr. Henderson, gardener to Sir George Beaumont, Bart., Coleorton Hall, Ashby-de-la-Zouch, for a handsomely grown Antigua Pine-apple, weighing 5 lbs. 6 oz. To Mr. Butcher, gardener to W. Leaf, Esq., F.H.S., for three bunches of Muscat of Alexandria Grapes of last year's growth in good condition.

MISCELLANEOUS SUBJECTS OF EXHIBITION. Two Enville Pine-apples, weighing respectively 3 lbs. 13 oz. and 4 lbs.

4 oz., from Mr. Taylor, gardener to J. Coster, Esq., of Streatham. Cut specimens of a Scarlet Pelargonium, called "Conway's Royalist," a variety which has been found to force well, from Mr. Conway, of Earl's Court Nursery, Brompton Road. A specimen of Æschynanthus speciosus, and a small well-flowered plant without leaves of Fuchsia macrantha, from Messrs. Veitch. The latter was sent to show that it is not a shy bloomer, as has been stated by some. It had been wintered under a cool greenhouse stage, and was stated to dislike heat. Mr. Silver, gardener to the Rev. H. Pole, Maidenhead, sent cut specimens in flower of Deutzia scabra and Weigela rosea, in order to show the comparative merits of the two plants for early forcing. They were introduced into heat at the same time, and the Weigela was greatly in advance of the other. From Mr. Grey, gardener, Beaufront, Northumberland, came a specimen of Chinese Primula, which, together with several others, had been flowered in the open ground at Beaufront. They were stated to have stood the winter without protection, although on the 3rd of January the thermometer had fallen to 14° Fahrenheit, and the ponds were covered with ice from three to four inches in thickness. The plants turned out were seedlings in the autumn of 1847, and, after contributing to the gaiety of the conservatory in the spring of 1848, they were transferred to the open border in May, where they bloomed beautifully through the summer and autumn; and it was stated that they are now (February 20) again unfolding their blossoms. The Hon. W. Fox Strangways sent a collection of cut specimens of plants in flower in the open ground at Abbotsbury, as examples of the mildness of the climate of the south of Dorsetshire. It consisted of three sorts of Indian Rhododendron, which had received no protection whatever; three of Camellia, but not sent as examples of the climate; the Tree Heath (Erica arborea), which is reported to quite scent the air of the south of Europe with its fragrance; two of the more tender Hellebores (H. argutifolius and olympicus); the sweet-smelling Italian Laurustinus; a beautiful Florence Tulip (T. Raddiana); a red variety of the Nepaul Saxifraga ligulata; and some spring bulbs. Among the latter was the large-flowered Snowdrop (Galanthus plicatus). This was not sent as an instance of mildness of climate, but to exhibit its superiority in size over the common snowdrop. It is quite as hardy as the latter, much larger, and therefore more desirable. The above were all from the open garden, in which it was mentioned many other things were also in

flower, and along with them came a branch of Juniperus phœnicea, female, with fruit, and producing also young flowers. "The old catkins," Mr. Strangways writes, "are fallen from the male, and will not reappear for some months. The plants stand 100 yards apart, with many trees, cypress and others, between them, yet they fertilize. They are 12 or 14 feet high, about 20 years old, from seed from the south of Naples, where I have seen them growing on barren calcareous hills and rocks overlooking the rich plain of Taranto. It is certainly a handsome evergreen." Mr. Mills, of Gunnersbury, sent a brace of the Browston Hybrid Cucumber, a variety stated to be quite as early as the Jewess and old Southgate varieties. One was the produce of a cutting struck in September last; the other of a plant raised from seed sown at the same time. They were stated to have been grown in a pit heated by dung linings. Mr. Mitchell, of Enfield, produced samples of his Royal Albert Rhubarb; and two sorts of Sea-kale were contributed by Messrs. Vilmorin, of Paris. The French, it was stated, distinguish varieties of this vegetable, and, according to them, the different kinds possess very different properties. Of the two sorts sent, one was the common Violet Sea-kale, the other a pale variety, stated to be ten days earlier than the former and less bitter. Specimens of his material for protecting fruit tree blossoms from early spring frosts were exhibited by Mr. Yexley, of Merton, Surrey; and Messrs. Dietrichsen and Hannay, of Oxford Street, showed one of their Patent Garden Engines, which pour water against the plant or tree in one continued stream by the upward and downward stroke of the handle. Mr. Montgomry, of the Saw Mills, Brentford, exhibited various forms of rafters, sash bars, &c., made well and at a cheap rate by a contrivance for the purpose which he has attached to his saw mill.

Novelties from the Society's Garden. Acacia celastrifolia, a pretty species in the way of the myrtle-leaved Acacia; and a nice plant of Æschynanthus pulcher.

A collection of Begonias, and other plants of soft-wooded character, which had been grown under Hartley's patent rolled or rough plate glass, with a view to determine its value for gardening purposes, was brought under the notice of the meeting, together with a sample of the glass, by the Vice-Secretary, whose observations on the subject were to the following effect:—

"It is now six months since the fitness of Rolled Rough Plate Glass to supersede the common sheet was suggested. The impossibility of obtaining the latter, with any certainty that it will not burn the leaves beneath it, had become notorious, and cheap rough plate was suggested as a substitute. This kind of glass is made of the same materials as sheet, but by a very different process. Instead of being in the first instance blown into the form of a cylinder, or 'muff,' then slit and flattened—a difficult process, incapable of making it level or free from large irregular lenses—rough plate is at once rolled into plates, and left with an irregular granulated surface, which breaks and bends and separates the rays of light as they pass through it, thus rendering their concentration, and the burning consequent upon it, impossible. But it was objected, by those whose opinion in all practical matters has deservedly the greatest weight, that, although this rough glass might be suitable for glazed structures in the summer, it could not be safely employed in winter 'because of the small quantity of light that was able to pass through it;' and that, therefore, any advantage that might attend it in one season would be counterbalanced at another. This was entirely at variance with my own opinion; I saw no difference in the quantity of light that passed through: on the contrary, the amount appeared to be the same in both cases, the difference being that, by rough plate, light was dispersed, and by common sheet concentrated, or at least not interfered with by dispersion. It was, however, felt that the objections taken to the former would be better answered by an experiment than by any man's opinion; and therefore the Garden Committee directed it to be tried in the Garden.

"For this purpose a small pit, unventilated except by sliding the sashes, and heated by hot-water pipes, was selected. In the last week of August this pit was filled with soft-wooded plants, which can only be kept in health in the presence of a large quantity of light, among which were the following, viz.: the Begonias odorata, undulata, argyrostigma, and dichotoma, Torenia asiatica, Pentas carnea, Adamia sylvatica, Calostylis aurantiaca, and Achimenes picta. The four Begonias, Calostylis, Adamia, and Pentas had been cut close back, and were leafless, Torenia was a cutting just struck, and of Achimenes the dry tubers were employed. The experiment was thus set in action, without any special care having been taken to make it succeed; on the contrary, everything was against success.

"It is needless to say that the months of October, November, and December, 1848, were more than usually gloomy, and that neither January nor February offered any advantage over those months in ordinary years. In addition to this, it was often necessary to leave the plants in the dark all day long, in consequence of the sashes being covered with frozen mats, which could not be removed. Nevertheless, and notwithstanding these impediments, the experiment was perfectly successful.

"Mr. Gordon, to whom the experiment was confided, produced the plants above named in the most beautiful health, with firm short wood, broad, thick, clean, bright-green leaves, and, in the case of the Gesnera and Pentas, flowers perfect in colour, size, and form. In short, it may be said without the least exaggeration, that more perfect examples of high cultivation were never seen, and few so perfect. It was clear that there had been no deficiency of any element or condition which is required for the most perfect health.

"This conclusive proof of the excellence of rough plate glass possesses the highest horticultural interest. It shows that gardeners are now secured effectually from the scorching effects of the sun during summer, and that all the costly as well as inconvenient contrivances for shading may be in future dispensed with. A gentleman of my acquaintance has lately been called upon to pay for shading a single span-roofed house no less a sum than 60*l.*, which is little less than the whole cost of the glass roof; had the value of rough plate glass been known only nine months ago, this vexatious outlay might have been avoided. Such glass does all that a screen can do, and no light is intercepted."

Cuttings of the following three Pears and Cherry were distributed to such Fellows as wished to receive them :—

1. Beurré d'Amanlis, a large obovate pear ripening in September, superior to the Brown Beurré in quality, and so much hardier that it bears well as a standard, whereas the Brown Beurré will not succeed as such.

2. Eyewood, one of the late Mr. Knight's valuable hardy pears, ripe in October. Fruit of it from a standard is as large as that of Gonsel's Bergamot; rich and excellent.

3. March Bergamot, also raised by Mr. Knight. The fruit is about the size of that of the Autumn Bergamot, and like it in shape. It will keep till March, or even later. Mr. Knight stated that it would be found very

valuable in cold and unfavourable situations in which the French and Belgian varieties would not succeed.

The shoots of this, as well as those of the Eyewood, are very thorny when the trees are young; but fewer are produced as they get older, and fruit-spurs are then formed in their place.

4. Werder's Early Heart Cherry, a black fruit, of German origin, rich, and much earlier than the May Duke.

BOOKS PRESENTED.

The Seventeenth Annual Report of the Royal Horticultural Society of Cornwall. From the Society.
The Quarterly Journal of the Geological Society. No. XVII. From the Society.
Transactions of the Royal Society of Edinburgh. Vol. XVI., Part 4; and Proceedings of the Royal Society of Edinburgh. Vol. II., Nos. 31 and 32. From the Society.
The Athenæum for January. From the Editor.
On Climate in Connection with Husbandry, with reference to a work entitled Cours d'Agriculture, par le Comte de Gasparin, by the Right Hon. the Earl of Lovelace. From the Author.

SPECIAL GENERAL MEETING. The Society then resolved itself into a special general meeting, which had been previously summoned by post, according to the by-laws, for the purpose of electing a new member of Council, in the room of the Earl of Auckland, deceased. The chairman (the Duke of Northumberland, Vice-President) announced that the Council had recommended as a fit and proper successor the Right Hon. Lord Ashburton; this nomination having been supported by Mr. Hutton and Dr. Daniel, the ballot took place. At its close, his Grace named, as scrutineers, P. Pole, Esq., C. Devon, Esq., and Mr. C. Loddiges, who reported that the Right Hon. Lord Ashburton had been elected unanimously, and that 18 Fellows had voted.

March 6, 1849. (REGENT STREET.)

ELECTIONS. Mr. George Paul, of Cheshunt; and Mr. Charles Turner, of Slough.

AWARDS. *Knightian Medal:* To Mr. Wilmot, F.H.S., for a dish of Black Hamburgh Grapes, from his Vines grown in the remarkable manner described in Proceedings, p. xvi.

The Vice-Secretary having afterwards personally examined the place where these Vines grew, published the following account of the case in the 'Gardener's Chronicle.'

"In July, 1846, Mr. Wilmot planted in the footpath, at the back of some Pine pits, a number of young Black Ham-

burgh Vines, and introduced them into the houses by knocking a brick out of the back wall next the ground. These Vines, planted in a footpath, made of materials to walk upon, on the *north side* of a Pine stove, grew the first year 20 feet long. On the 16th of January of the present year a leaf from one of them, measuring 21 inches the one way, and 18 inches the other, was exhibited to the Horticultural Society, and on the 6th of March (present meeting) a dish of ripe Grapes from a part of these Vines obtained a Silver Knightian Medal. The bunches were small, as all Mr. Wilmot's are, heavy bunches of Grapes, not answering the purpose of growers for market; but they were well swelled, covered with bloom, and perfectly well coloured.

"When the Vines were planted, holes were made in the footpath with a pickaxe, and about a couple of quarts of soil in which Pine-apples had been grown was added to each hole, the crocks having been first sifted out. This was done for the purpose of forming a bed in which the young roots might lie, the soil of the footpath being too rough and coarse for them.

"As to the footpath itself, in order that there might be no mistake upon that point, we have examined it, and we can state that the soil of which it is composed becomes, when dry, as hard as the high road. This is owing to the presence of a large quantity of red brick earth, of which Mr. Wilmot's market garden naturally consisted; with this is mixed a large quantity of pounded clinkers from the stoke-holes where coke or coal is burnt, some loam, and a quantity of the ordinary well tilled soil of the garden. Next the walk where the Vines grow, whose leaves have been just described, there is, within four feet, the trench of a Macphail pit filled with long litter, for heating a Pine bed. The other footpath, where similar Vines are growing, is a mere space lying between two Pine houses. In both cases these borders or footpaths are, as has been already stated, on the north side of the wall of the Pine house, and can receive no direct heat from the sun, even in summer.

"To what cause, then, may we assign this extraordinary growth, so wholly unexpected by everybody? It cannot be to the marvellous richness of soil; that is evident. It cannot be to high temperature; for although the footpath in one case was on the edge of a trench for dung, yet Mr. Wilmot states that that trench was not worked till long after the Vines had made their first growth.

"But although a very high temperature of the soil can

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hardly be taken as the cause, we are by no means sure that temperature may not have something to do with this unusual growth. The Vines were planted in July; and in gardens so much worked, and so much inclosed, and so traversed by hothouses in all directions as Mr. Wilmot's is, the heat of the soil may have been higher than is imagined, even although the sun could not directly shine upon it. But there was another cause in operation. The Pine-houses in question should rather be called pits; for they are sunk from 2 to 3 feet below the level of the soil; being almost constantly heated by hot water pipes, the warm air of the pit must communicate some part of its heat to the surrounding soil—to what extent we have no means of ascertaining.

"The soil too is by no means poor; the path in which grew the Vines with large leaves must be greatly enriched with the soakage from the Macphail pits: and although it becomes as hard as a brick, it is not, therefore, compact; on the contrary, the fragments of clinkers maintain its porosity effectually, and permit a ready passage to any heat that may be communicated to it."

Banksian Medals: To Messrs. Knight and Perry for a nice specimen of Dielytra spectabilis, a handsome Fumewort sent to the Society from the North of China by Mr. Fortune. It is described and figured in vol. ii. t. 3. To Mr. Mylam, gardener to S. Rucker, Esq., F.H.S., for a finely blossomed plant of Phalænopsis amabilis.

Certificates of Merit: To Messrs. Henderson, of Pine-Apple Place, for a specimen of Billbergia zebrina. To Mr. Henderson, Wellington Road, St. John's Wood, for a seedling Cineraria named Delicata, a cupped flower, white, margined with violet, small, but striking.

Miscellaneous Subjects of Exhibition. Six unnamed Seedling Cinerarias from Mr. Lee, of Hammersmith; a Seedling Pelargonium named Woodlands, well coloured, a good trusser, and reported to be suitable for early forcing, from Mr. Lane, of Great Berkhampsted; Portlandia grandiflora, from Messrs. Henderson; Odontoglossum stellatum, from Messrs. Jackson, of Kingston; and two fruit of what were called Vegetable Marrows, from St. Michael's, from Mr. Charlwood, F.H.S., Covent Garden. The Vice-Secretary stated that the latter were not Vegetable Marrows at all; but the pale-coloured, obovate, wrinkled, citron-like fruit of Sechium edule or Choco, plants of which were

tried some years ago in the Society's Garden, and proved too tender for our climate.

NOVELTIES FROM THE SOCIETY'S GARDEN. Thea assamica or Assam Tea, a robust growing large-leaved species, as unlike the Green Tea as the latter is to the tea from the south of China, which is of an inferior kind. Also a well-flowered specimen of Inga pulcherrima. This, though proverbially a shy flowering plant, has been found to blossom well in the garden, the essential point of success consisting in encouraging it to make wood early in order that the latter may be well ripened before winter.

The following cuttings of Pears were distributed to such Fellows as wished to receive them:—

1. Shobden Court, a middle-sized obovate fruit of yellowish-russet colour, and rich sugary flavour; ripe in January and February. It is amongst the latest raised of the race of hardy pears introduced by the late Mr. Knight.
2. Knight's Monarch, also raised by Mr. Knight. The true sort cannot be too generally cultivated. In various parts of the country where it has been tried it has invariably proved excellent. Ripe in December, January, and February.
3. Broom Park, a remarkably sugary pear, middle-sized, roundish, with a flavour partaking of those of the Melon and Pine Apple. Ripe in December and January.
4. Comte de Lamy, middle-sized, roundish, sugary and rich; ripe in October. The tree has an upright mode of growth, and bears abundantly.

These are all hardy pears of excellent quality; and better from standards or dwarfs than from walls.

BOOK PRESENTED.
The Athenæum for February. From the Editor.

March 20, 1849. (REGENT STREET.)

ELECTIONS. The Rev. W. B. L. Hawkins, M.A., Lewell, Dorsetshire; and Frederick Ashby, Esq., Staines.

AWARDS. *Knightian Medal:* To Mrs. Lawrence, F.H.S., for a collection of Stove and Greenhouse plants.

Banksian Medals: To Mr. Rivers, gardener to R. W. Eyles, Esq., F.H.S., for the same. To Mr. Iveson, gardener to the Duchess Dowager of Northumberland, for ripe fruit of the Vanilla (V. planifolia), and for a hardy hybrid Rhododendron, with large compact heads of handsome white flowers. To Mr. Bunney, of Stratford, for a pretty brown and yellow-flowered Oncidium, apparently new to gardens; and to Messrs. Henderson, of Pine Apple Place, for the following collection of Hyacinths:—*Blues:* Emicus; Prince Van Saxe Weimar, double; L'Ami Cœur, Vulcan, Richard Cœur de Lion, Le plus Noir, Graaf Van Nassau, Tubal Cain, Charles Dickens, William the First. *Pale blue:* with lighter tubes, Laurens Koster, double; Grande Vidette (one of the best); A la Mode, double; Orandates; Passe tout; Prince Frederic, double. *White:* La Candeur, Madame Talleyrand, Virgo, States General, Helene, Victoria Reginæ, Grande Vidette. *Red:* Van Speyke, L'Eclair, Appellius. Panorama, La Dame du Lac, Talma, Lord Wellington, Waterloo, double; Norma. *Black, or nearly so:* Prince Albert. *Plum-coloured.* La Unique, a desirable variety on account of its colour, which is new to Hyacinths.

Certificates of Merit: To Messrs. Fairbairn, of Clapham, for a beautifully-grown plant of the late Mr. McNab's variety of Erica aristata major. To Messrs. Veitch for a Dendrobium from Moulmein, blush-coloured, with a yellow blotch in the lip.

Miscellaneous Subjects of Exhibition. Messrs. Veitch sent Camellia Storyi, a variety in the way of Imbricata, pretty, and stated to be constant in character; also their hardy Yellow Violet from Patagonia. Mr. Henderson, of Wellington Nursery, St. John's Wood, contributed Azalea obtusa and various Cinerarias. Messrs. Kendall, Townsend, and Gaines also showed seedlings of the same useful genus. Mr. Drummond, gardener to C. H. Leigh, Esq., Pontypool Park, produced a Ripley Queen Pine Apple, weighing 2 lb. 12½ oz.: it was stated to have been grown in turf, broken bricks, and rough charcoal.

Novelties from the Society's Garden. Mr. Fortune's double-flowered White Chinese Peach, a handsome hardy addition to our shrubberies; and a very dwarf compact white-flowered Azalea from the North of China, differing from the common White Chinese Azalea not only in having

but five stamens instead of ten, but also in other important particulars.

Book Presented.

Address delivered at the Anniversary Meeting of the Entomological Society of London, 1849, by William Spence, Esq., President. From the Author.

April 3, 1849. (Regent Street.)

Election. The Rev. J. Heyworth, Bristol.

Awards. *Knightian Medals:* To Mr. Iveson, gardener to the Duchess Dowager of Northumberland, for an exhibition of cut flowers of light-coloured Rhododendrons. These had compact heads of flowers as large as those of the Red Tree Rhododendron, and of the most delicate colours imaginable. There were five sorts, three of which were named as follows:—Clivianum, Syonense, and Percyanum; the other two were less remarkable. The two first-named kinds were delicate pink, with the upper petals of each flower richly covered with deep crimson spots. Percyanum was somewhat smaller than its associates, and free from spots, but veined with deeper pink, and beautifully transparent. They have been obtained, it is believed, by crossing Catawbiense, or the White Pontic Rhododendron, with the White Indian arborescent kind. They were stated to be quite hardy, and to have been growing in the open border until the flower-buds were about to open, when they were lifted, and flowered under glass. This practice, or that of covering the plants where they grow so as to give shelter to the flowers, which are apt to be injured by the weather, was recommended in all cases where fine blooms are required. To Messrs. Henderson, of Pine Apple Place, for a collection of Stove and Greenhouse plants, among which was a pretty specimen of their new Eriostemon intermedium, also for a collection of Hyacinths, whose names were as follows:—The double ones are marked with D, the single ones with S. *Pink:* Prince of Wales, D; Monsieur de Taesch, S; Acteur, D; Comtesse de la Coste, D; Bouquet Royal, D; Perruque Royal, D; Triumph Blandina, D; Professor Lindley, D; Duchess de Parma, D. *White:* Minerva, D; La Vestale, D (one of the best whites); Ne Plus Ultra, D; Grande Blanche Imperiale, S; Don Gratuit, D. *Red:* Sans Souci, D; Mars, S. *Dark blue:* Alfred the Great, D; Quentin Durward, S; Bouquet

Pourpre, D. *Pale blue:* Grand Sultan, D; Globe Terrestre, D; Oscar, S; Robinson, S; Bloxburgh, D; Parmenio, D; King of the Netherlands, D; Paartboots, D; Mignonette de Dryfhout, D; Comtesse de St. Proust, D. *Cream:* Groot Voorst, D. *Yellow:* Herman Sange, D.

Certificates of Merit: To Mr. Turner, F.H.S., for an exhibition of Heartsease, consisting of Thomson's Constellation, Hooper's Mary Jane, Nasmyth's Mrs. M. Hamilton, Hooper's Brutus, Bell's Lord John Russell and Duke of Norfolk, Turner's Charmer and Commodore, Bell's Climax, Turner's Miss Edwards, Bell's Aurora, Youell's Supreme, Turner's Surplice and Mrs. Beck, Oswold's Undine, Hooper's Attila, Thomson's Duchess of Rutland, Hooper's Wonderful, Turner's Caroline, Bell's Duchess of Norfolk, Backhouse's Dr. Wolff, Collison's Perseus, Hooper's Milo, Turner's Optimus. To Mr. Toy, Oatlands Palace Gardens, Weybridge, for a well swelled and beautifully coloured dish of Keens' Seedling Strawberry.

Miscellaneous Subjects of Exhibition. Mr. Craggs, gardener to Sir T. D. Acland, Bart., M.P., sent flowers raised from the seed of the Highclere Rhododendron altaclerense. These were inferior to that variety, and served to confirm the fact that when hybrids do seed, the seedlings raised from them are almost certain to return sooner or later to the state of their parents. Mr. Henderson, of Wellington Nursery, St. John's Wood, contributed a collection of Cinerarias, among which Cerito was the best. A tray of Camellia blooms, from plants growing in the open garden at Abbotsbury in Dorsetshire, was exhibited by the Hon. W. F. Strangways, who furnished the following memoranda respecting them :—

"The specimens exhibited are from a number of standard bushes of Camellias growing intermixed with other shrubs in the middle of the garden, totally unprotected by any wall or other shelter, though partially shaded by taller trees. They are of various sorts, taken without much selection, and seem all to thrive equally well: they have been planted some as long as ten, none less than three or four years. They are but little pruned, and are left to their natural habit, which, it is interesting to observe in plants left to themselves, varies much in the different varieties. Some grow into round bushes, some take a fastigiate or aspiring shape, some spread widely near the ground, and others have a loose, almost pendulous habit of growth.

Until ten years ago the Camellias planted out at Abbotsbury were placed in the warmest and most sunny spots in the garden, planted in the natural soil, a rich red ferruginous loam, in which it was found they never flowered, produced few and yellow leaves, and dwindled away to a naked and unsightly stick, and generally died after a few years. It then occurred to the gardener to treat them as far as possible on an opposite system, and to plant them in the shade not of a wall. but of trees, in a black, nearly pure, peat soil, not too wet, in a low cool part of the garden sloping to the north. This treatment has succeeded so well that it is recommended to all gardeners possessing peat soils to plant out all their spare Camellias as freely as their Rhododendrons, and to treat them nearly in the same manner. All the varieties hitherto tried seem to do equally well; seed has been sometimes formed: the quantity of flower is very great, and, though put forth early in the winter, comes forward so slowly, even in the mildest season, as to secure the flowering from being prematurely hastened in the spring. So great an acquisition to hardy gardening as the culture in the open ground of the numerous varieties of one of our choicest flowering shrubs, and certainly one of the finest evergreens, and which with little trouble may be had in profusion, seems worthy of more extended observation and experiment. Peat and shade,—in a word, the usual treatment of American plants, seem to be all that is requisite for the attainment of this object, to which it will be a great satisfaction to have practically pointed out the way."

Novelties from the Society's Garden. A plant of Begonia dichotoma, which had been grown under rough plate glass. It exhibited the best possible health, its large glossy leaves being of the deepest green.

Books Presented.

Syllabus of a complete Course of Lectures on Chemistry. By Professor E. Solly. From the Author.
The Athenæum for March. From the Editor.
Comptes Rendus des Séances de l'Académie des Sciences. Tome XXVII. From the Academy.

April 17, 1849. (Regent Street.)

Elections. Col. Hall, M.P.; H. Tuke, Esq., Manor House, Chiswick; and Mr. B. T. B. Gibbs, Half Moon Street, Piccadilly.

Awards. *Banksian Medals:* To Mr. Jones, gardener to E. Hutchings, Esq., Dowlais House, Glamorganshire, for four Queen Pine Apples, nicely swelled for the season. They weighed respectively 3 lbs. 10 oz., 3 lbs. 8 oz., and two 3 lbs. 7 oz. To Mr. Davis, of Oak Hill, East Barnet, for a handsomely grown Providence Pine, weighing 7 lbs.

Certificates of Merit: To Mr. Drummond, gardener to C. H. Leigh, Esq., Pontypool Park, for a good specimen of the smooth-leaved variety of Cayenne Pine Apple, weighing 4 lbs. 4 oz. To Mr. Myatt, of Deptford, for a remarkably fine specimen of Cyclamen persicum, forming a mass of flowers 18 inches across, and this from a single root in a 12-inch pot. To Mr. Pond, of Bath, for eleven Seedling Cinerarias. Among these the most striking were Bride, pale lilac, with a light centre; and Bridesmaid, a large flower, white, tipped with purplish lilac.

Miscellaneous Subjects of Exhibition. Mr. Smith, gardener to G. Anderson, Esq., of Regent's Park, sent Rondeletia thyrsoidea, a plant new to gardens, which had been obtained by sowing the soil which was found adhering to the roots of some plants imported from Guatemala. Mr. Henderson, of Wellington Nursery, St. John's Wood, showed a group of Seedling Cinerarias, the best of which were Mdlle. Rosati, white with a dark disc, and edged with bluish lilac, a fine flower, but rather small; Mdlle. Perodi, in the way of Kendall's Beauty of Newington; Flora M'Ivor, intense crimson purple; Nymph, white with a purple centre; Fanny Ellsler, white; and Bessy, a deep velvety purple, which contrasted well with the yellow pollen masses of the disc. Mr. Salter, Versailles Nursery, Hammersmith, sent a seedling Cineraria named Incomparable. Several cut specimens of crimson and delicate pink Rhododendrons, together with a bunch of the yellow Chinese Azalea, were exhibited by Mr. Cox, gardener to W. Wells, Esq., of Redleaf. Mr. Frost, of Dropmore, sent flowers of two seedling Azaleas, named Frostii and Andersonii; and along with them a cut specimen of the red-flowered Hæmanthus multiflorus, a poisonous plant from the tropical parts of Africa. Mr. Davis, of Oak Hill, showed Sweetwater

Grapes, good bunches, but hardly ripe. Mr. Toy again sent specimens of Keens' seedling Strawberry, and along with them a plant of the same in fruit. A clean-looking sample of Ash-leaved Kidney Potatoes, perfectly free from disease, was exhibited by Mr. Torbron, gardener to J. Lane, Esq., of Leyton. They were stated to have been produced thus:—In December the tubers were set vertically in pots, in rich soil, and placed in a vinery. When the young growths had advanced from 4 to 6 inches in length, and had presented the leaves to the light, they were removed to a greenhouse and placed along the pathway. Early in February a leaf-pit was prepared for them, having no flues or linings. The plants were turned out of the pots and planted in rows 18 inches apart, in the soil which was placed above the dead leaves. They were watered, to settle the soil about their balls, and were stated to have received no water since, it being apprehended that, as there was no command of artificial heat, if water was given them they might become dropsical and diseased. They produced young potatoes fit for table in the third week in March. Air was admitted on all favourable occasions by partially removing the lights. In this way it was stated that by turning the dead leaves so as to create a little heat, two crops might be obtained in the year. Mr. Warner, of Jewin Street, sent one of his Patent Garden Engines, the chief novelty of which consists in the fulcrum on which the handle rests being fixed outside the water-pipe. By this means no part of the handle is connected with the water-tube, and a sound joint at the axis of the handle is maintained.

Novelties from the Society's Garden. Erica zinzinella, a variety adding the flowers of hiemalis to the habit of propendens, and a plant of Nemophila maculata, concerning which it was mentioned that in some of the plants the violet spotting is more disposed to run into the white ground colour than in others. There is also a difference in different plants as regards the size of the flowers. Packets of Potato seed from New Zealand, presented to the Society by Earl Grey, were distributed among the Fellows.

Books Presented.

Nova Acta Academiæ Naturæ Curiosorum. Volume XXII., Part I.; and the Supplement to Vol. XXI. From the Academy at Breslau.
Glenny's Hand-Book to the Flower Garden, Shrubbery, and Greenhouse. Part II. From the Author.

May 1, 1849. (REGENT STREET—ANNIVERSARY.)

The following Fellows of the Society, viz.:—

The Bishop of Winchester,
Col. Challoner,
Dr. Jackson,

were elected new Members of the Council, in the room of

Sir George Staunton, Bart.,
J. H. Schröder, Esq.,
C. B. Warner, Esq.

The following Fellows of the Society were elected officers for the ensuing year, viz.:—

The Duke of Devonshire, President;
Robert Hutton, Esq., Treasurer;
J. R. Gowen, Esq., Secretary.

The Annual Report from the Council and Auditors was read (see the body of this volume).

It was moved by Mr. John Glenny, seconded by Peter Pole, Esq., and carried unanimously, that the Report now read be adopted.

The following notice was suspended in the meeting-room:—

"*Lectures on Horticulture*, 1849.—Dr. Lindley having consented to deliver Six Lectures on Horticulture to the Fellows of the Society during the months of May, June, and July, the Council have appointed the following Tuesdays for this purpose, at three o'clock, P.M., viz.:—

May—15th and 22nd;
June—12th and 26th;
July—3rd and 17th;

and in order to facilitate the dispatch of other business, these lectures have been also appointed Ordinary General Meetings, at which Fellows of the Society may be elected, and objects of exhibition received.

"The subjects of the lectures will be:—

May 15th.—The materials from which plants derive their FOOD.
,, 22nd.—The ROOT, its means of obtaining food, and its other properties.
June 12th.—The LEAVES and their importance in the general economy of the plant.
,, 26th.—The STEM, whether regarded as timber or as a means of propagation: together with the circumstances which hasten or defer its destruction by decay.
July 3rd.—The FLOWER and FRUIT of plants, the circum-

stances which most contribute to their perfection or imperfection.

July 17th.—The DISEASES to which plants are liable, and the mode of alleviating them; so far as existing knowledge offers the means of forming any judgment.

"These lectures will be illustrated by specimens, explaining the subjects under consideration; and persons who have any remarkable objects which bear upon the questions of the day, are invited to send them to Regent Street. It must, however, be clearly understood that such objects cannot be received one moment later than twelve o'clock on the day of lecture."

May 5, 1849. (Garden Exhibition.)

The day of this exhibition was ushered in by a warm and brilliant morning. Up to half-past one everything was fair and favourable; but at that time a thunder-storm came up, driving to the tents the part of the visitors already in the garden, and home again those who were still on the road. After an hour or so the rain ceased, the air cleared, and the temperature rose, shortly after which the bands were playing and the visitors promenading. The number of the latter was, however, much curtailed by the storm; the total number being 2054, exclusive of exhibitors and persons officially employed. As regards the exhibition itself, it equalled generally, and in many particulars surpassed, any May show of former years. Azaleas were produced in great abundance and in unusual splendour; and the same remark applies to Orchids and Roses in pots. The latter, indeed, whose cultivation under such circumstances was once deemed hopeless, were the admiration of everybody.

The Award was as follows:—

The Certificate of Honour: To Mr. May, gardener to Mrs. Lawrence, F.H.S., for a collection of thirty Stove and Greenhouse Plants.

The Large Gold Medal: 1. To Mr. Cole, gardener to H. Colyer, Esq., of Dartford, for a collection of thirty Stove and Greenhouse Plants. 2. To Mr. Williams, gardener to C. B. Warner, Esq., F.H.S., for twenty species of Exotic Orchids.

The Gold Knightian Medal: 1. To Mr. Taylor, gardener to J. Coster, Esq., of Streatham, for a collection of fifteen Stove and Greenhouse Plants. 2. To Mr. Mylam, gardener to S. Rucker, Esq., jun., F.H.S., for twenty species

of Exotic Orchids. 3. To Mr. Carson, gardener to W. F. G. Farmer, Esq., F.H.S., for ten species of the same. 4. To Mr. Smith, gardener to W. Quilter, Esq., of Norwood, for fifteen varieties of Cape Heath. 5. To Messrs. Rollisson, of Tooting, for the same.

The Gold Banksian Medal: 1. To Mr. Carson, gardener to W. F. G. Farmer, Esq., F.H.S., for a collection of fifteen Stove and Greenhouse Plants. 2. To Messrs. Veitch and Son, of Exeter, for twenty species of Exotic Orchids. 3. To Mr. Plant, gardener to J. H. Schröder, Esq., F.H.S., for ten species of the same. 4. To Mr. Mylam, gardener to S. Rucker, Esq., jun., F.H.S., for fifteen varieties of Cape Heath. 5. To Messrs. Veitch and Son, for the same. 6. To Messrs. Paul, of Cheshunt, for twelve varieties of Roses in pots. 7. To Mr. Green, gardener to Sir E. Antrobus, Bart., F.H.S., for a collection of Greenhouse Azaleas, in twelve varieties.

The Large Silver Gilt Medal: 1. To Mr. Green, gardener to Sir E. Antrobus, Bart., F.H.S., for a collection of fifteen Stove and Greenhouse Plants. 2. To Mr. Jack, gardener to R. G. Loraine, Esq., of Wallington, Surrey, for a collection of six Stove and Greenhouse Plants. 3. To Mr. Dobson, gardener to Mr. Beck, F.H.S., for ten species of Exotic Orchids. 4. To Mr. Jack, for six species of the same. 5. To Mr. Hamp, gardener to J. Thorne, Esq., of South Lambeth, for a collection of Amaryllids. 6. To Mr. Cock, F.H.S., for six new varieties of Pelargonium, in 8-inch pots. 7. To Mr. Dobson, for the same. 8. To Mr. Parker, gardener to J. H. Oughton, Esq., of Roehampton, for six varieties of Pelargonium, in 11-inch pots. 9. To Mr. Dobson, for the same. 10. To Mr. Gaines, F.H.S., for six fancy Pelargoniums. 11. To Mr. Slowe, gardener to W. R. Baker, Esq., F.H.S., for twelve varieties of Roses in pots. 12. To Messrs. Lane and Son, Great Berkhampstead, for the same. 13. To Mr. Cole, gardener to H. Colyer, Esq., of Dartford, for fifteen varieties of Cape Heath. 14. To Messrs. Pamplin, Lea Bridge Road, Essex, for the same. 15. To Mr. Taylor, gardener to J. Coster, Esq., for nine varieties of the same. 16. To Mr. May, gardener to Mrs. Lawrence, F.H.S., for a collection of Greenhouse Azaleas, in twelve varieties. 17. To Mr. Carson, gardener to W. F. G. Farmer, Esq., F.H.S., for the same in six varieties. 18. To Mr. Green, gardener to Sir E. Antrobus, Bart., F.H.S., for Tall Cacti in flower. 19. To Mr. Parker, gardener to J. H. Oughton,

Esq., for six *distinct* species of Pelargonium, exhibiting superior cultivation.

The Certificate of Excellence: 1. To Mr. Gerrie, gardener to Sir John Cathcart, Bart., F.H.S., for a collection of fifteen Stove and Greenhouse Plants. 2. To Mr. Slowe, gardener to W. R. Baker, Esq., F.H.S., for a collection of six Stove and Greenhouse Plants. 3. To Mr. Gaines, F.H.S., for six new varieties of Pelargonium, in 8-inch pots. 4. To the same, for six varieties of Pelargonium, in 11-inch pots. 5. To Mr. Francis, of Hertford, for twelve varieties of Roses, in pots. 6. To Messrs. Frazer, Lea Bridge Road, Essex, for a collection of Greenhouse Azaleas, in twelve varieties. 7. To Mr. Gerrie, for the same, in six varieties. 8. To Mr. May, gardener to Mrs. Lawrence, F.H.S., for Pimelea spectabilis.

The Large Silver Medal: 1. To Mr. Pawley, of Bromley, Kent, for a collection of fifteen Stove and Greenhouse Plants. 2. To Mr. Bruce, gardener to Boyd Miller, Esq., of Tooting, for a collection of six Stove and Greenhouse Plants. 3. To Mr. May, gardener to Mrs. Lawrence, F.H.S., for ten species of Exotic Orchids. 4. To Mr. Ivison, gardener to the Duchess Dowager of Northumberland, F.H.S., for Dendrobium Wallichianum. 5. To Messrs. Fairbairn, of Clapham, for Erica Cavendishii. 6. To Messrs. Rollisson, for Epacris miniata. 7. To Messrs. Veitch and Son, for Boronia spathulata. 8. To the same, for a new shrubby Calceolaria, from Peru. 9. To Mr. Fleming, gardener to the Duke of Sutherland, F.H.S., for a bunch of Black Hamburgh Grapes, weighing 2 lbs. 5 oz. 10. To Mr. Davis, gardener to Lord Boston, F.H.S., for three Providence Pineapples.

The Silver Knightian Medal: 1. To Mr. Malyon, gardener to T. Brandram, Esq., of Lea Grove, Blackheath, for a collection of fifteen Stove and Greenhouse Plants. 2. To Mr. Stanly, gardener to H. Berens, Esq., F.H.S., for a collection of six Stove and Greenhouse Plants. 3. To Mr. Glendinning, F.H.S., for the same. 4. To Mr. Bruce, gardener to Boyd Miller, Esq., for Dendrobium fimbriatum. 5. To the same, for Erica mutabilis. 6. To Messrs. Veitch and Son, for Æschynanthus speciosus. 7. To Mr. Slowe, gardener to W. R. Baker, Esq., F.H.S., for Tremandra verticillata. 8. To Mr. Jackson, F.H.S., for Rhododendron campanulatum superbum. 9. To Mr. Green, gardener to Sir E. Antrobus, Bart., F.H.S., for Erica Hartnelli. 10. To Mr. E. G. Henderson, of the Wellington

Nursery, St. John's Wood, for Boronia tetrandra. 11. To Messrs. Rollisson, for the best-named collection of Plants (no error in fifteen). 12. To Mr. Davis, of Oak Hill, East Barnet, for a basket of Black Hamburgh Grapes. 13. To the same, for four Providence Pineapples.

The Silver Banksian Medal: 1. To Mr. Campbell, gardener to Thos. Huggins, Esq., of Norwood, for a collection of fifteen Stove and Greenhouse Plants. 2. To Mr. Hamp, gardener to J. Thorne, Esq., of South Lambeth, for a collection of six Stove and Greenhouse Plants. 3. To A. Rowland, Esq., F.H.S., for twelve varieties of Roses, in pots. 4. To Mr. Ivery, of Peckham, for a collection of Cinerarias, in twelve varieties. 5. To Messrs. Rollisson, for a new Hoya, from Java. 6. To Mr. Cole, gardener to H. Colyer, Esq., for the second best-named collection of Plants (two errors in thirty).

The Certificate of Merit: 1. To Mr. E. G. Henderson, for a collection of Cinerarias, in twelve varieties. 2. To Mr. Carson, gardener to W. F. G. Farmer, Esq., F.H.S., for Azalea lateritia. 3. To Messrs. Rollisson, for Talauma mutabilis. 4. To Mr. Williams, gardener to C. B. Warner, Esq., F.H.S., for the third best-named collection of Plants (two errors in twenty). 5. To Mr. Mylam, gardener to S. Rucker, Esq., jun., F.H.S., for the third best-named collection of Plants (two errors in twenty). N.B. These two collections were named with equal accuracy.

May 15, 1849. (Regent Street.)

Elections. The Earl of Shelburne; J. F. Fletcher, Esq., Peel Hall, Bolton; J. G. Sheppard, Esq., Campsey Ash, Suffolk; A. Cuthill, Esq., Clapham Park; T. Fortescue, Esq., Ravensdale Park, Dundalk; H. Harms, Esq., Vassal House, Brixton Road; J. Edwards, Esq., Wace Cottage, Holloway; G. Reed, Esq., Manor House, Burnham, near Bridgewater; and Mr. H. Hart, 26, Pall-Mall.

Lecture. Dr. Lindley then delivered the first of the six Lectures on Horticulture, announced in a previous page. The subject was the "Food of Plants." With the assistance of apparatus, furnished by the Royal College of Chemistry, a series of beautiful experiments was skilfully performed by Mr. Medlock in illustration of the composition of plants, and of their food. Among these, the decom-

position of carbonic acid, and the consequent separation of its charcoal; of olefiant gas, with the same result; the conversion of the most delicate flowers into charcoal; the production of ammonia from coffee leaves; the conversion of starch, gum, and sugar into charcoal, by the removal of their water; and the formation of phosphoric acid, were particularly striking.

May 22, 1849. (REGENT STREET.)

LECTURE. Dr. Lindley delivered the second of his six Lectures on Horticulture. The subject was "The Root; its Means of obtaining Food, and its other Properties." On this occasion the manner in which roots are formed, and the means by which they feed, together with a variety of questions connected with growth, drainage, transplantation, potting, watering, manuring, forcing, &c., were illustrated by examples.

Specimens were also sent from the Society's Garden of the following plants:—Hoya imperialis (Messrs. Veitch's small-leaved variety), Lemonia spectabilis, Cyrtoceras multiflorum, a Parsonia from New Zealand, Lilium pyrenaicum, Nemophila maculata, Tropæolum edule, Erica Cavendishii, and Dillwynia clavata.

June 9, 1849. (GARDEN EXHIBITION.)

Than on this occasion a more delightful day, and a more glorious collection of flowers, have perhaps never been combined; the softness of the turf, the freshness of the foliage—here matured, there coloured with the peculiar tints of spring, banks of Rhododendrons in blossom, tents filled with an endless profusion of the most admirably varied flowers, together with a crowd of gay costumes, graceful forms, and happy faces, constituted a scene which has often been witnessed in these gardens and rarely elsewhere. The number of visitors present was 8839, exclusive of exhibitors and persons officially employed.

The AWARD was as follows:—

The Certificate of Honour: To Mr. May, gardener to Mrs. Lawrence, F.H.S., for a collection of thirty Stove and Greenhouse Plants.

The Large Gold Medal: 1. To Mr. Cole, gardener to H. Colyer, Esq., of Dartford, for a collection of thirty Stove

and Greenhouse Plants. 2. To Mr. Mylam, gardener to S. Rucker, Esq., F.H.S., for twenty species of Exotic Orchids.

The Gold Knightian Medal: 1. To Mr. Green, gardener to Sir E. Antrobus, Bart., F.H.S., for a collection of fifteen Stove and Greenhouse Plants. 2. To Messrs. Veitch and Son, of Exeter, for twenty species of Exotic Orchids. 3. To Mr. Plant, gardener to J. H. Schröder, Esq., F.H.S., for ten species of the same. 4. To Mr. Mylam, for fifteen varieties of Cape Heath. 5. To Messrs. Fairbairn, Clapham, for the same.

The Gold Banksian Medal: 1. To Mr. Taylor, gardener to J. Coster, Esq., of Streatham, for a collection of fifteen Stove and Greenhouse Plants. 2. To Mr. Williams, gardener to C. B. Warner, Esq., F.H.S., for twenty species of Exotic Orchids. 3. To Mr. Dobson, gardener to Mr. Beck, F.H.S., for ten species of the same. 4. To Messrs. Lane and Son, Great Berkhampstead, for twelve varieties of Roses in pots. 5. To Mr. Smith, gardener to W. Quilter, Esq., Norwood, for fifteen varieties of Cape Heath. 6. To Messrs. Rollisson, of Tooting, for the same. 7. To Mr. Green, gardener to Sir E. Antrobus, Bart., F.H.S., for Tall Cacti in flower.

The Large Silver Gilt Medal: 1. To Mr. Carson, gardener to W. F. G. Farmer, Esq., F.H.S., for a collection of fifteen Stove and Greenhouse Plants. 2. To Mr. Kinghorn, gardener to the Earl of Kilmorey, Twickenham, for a collection of six Stove and Greenhouse Plants. 3. To Mr. Rae, gardener to J. J. Blandy, Esq., F.H.S., for twenty species of Exotic Orchids. 4. To Mr. Smith, gardener to Mrs. Lawrence, F.H.S., for ten species of the same. 5. To Mr. Kinghorn, for six species of the same. 6 To Mr. Ivison, gardener to the Duchess Dowager of Northumberland, for a collection of Amaryllids. 7. To Mr. Roser, gardener to J. Bradbury, Esq., of Streatham, for twelve varieties of Roses in pots. 8. To Messrs. Paul, Cheshunt, for the same. 9. To Mr. Gerrie, gardener to Sir John Cathcart, Bart., F.H.S., for fifteen varieties of Cape Heath. 10. To Messrs. Veitch, Exeter, for the same. 11. To Mr. May, gardener to Mrs. Lawrence, F.H.S., for nine varieties of the same. 12. To Mr. Stanly, gardener to H. Berens, Esq., F.H.S., for six species of Cape Pelargonium. 13. To Mr. Cock, F.H.S., for six new varieties

of Pelargonium in 8-inch pots. 14. To Mr. Dobson, gardener to Mr. Beck, F.H.S., for the same, 15. To Mr. Parker, gardener to J. H. Oughton, Esq., Roehampton, for six varieties of old Pelargonium in 11-inch pots. 16. To Mr. Dobson, for the same. 17. To Mr. Ambrose, Battersea, for a collection of Fancy Pelargoniums. 18. To Mr. Falconer, gardener to A. Palmer, Esq., Cheam, for Tall Cacti in flower. 19. To Messrs. Veitch and Son, for Escallonia macrantha.

The Certificate of Excellence: 1. To Mr. Bruce, gardener to Boyd Miller, Esq., Tooting, for a collection of six Stove and Greenhouse Plants. 2. To Messrs. Loddiges, Hackney, for twenty species of Exotic Orchids. 3. To Mr. Carson, gardener to W. F. G. Farmer, Esq., F.H.S., for ten species of the same. 4. To Mr. Gerrie, gardener to Sir John Cathcart, Bart., F.H.S., for six species of the same. 5. To Mr. Dobson, gardener to Mr. Beck, F.H.S., for a collection of Achimenes. 6. To Mr. Francis, of Hertford, for twelve varieties of Roses in pots. 7. To Messrs. Pamplin and Son, Lea Bridge Road, Essex, for fifteen varieties of Cape Heath. 8. To Mr. Cole, gardener to H. Colyer, Esq., Dartford, for nine varieties of the same. 9. To Mr. Parker, gardener to J. H. Oughton, Esq., for six species of Pelargonium. 10. To Mr. Gaines, F.H.S., for a collection of Fancy Pelargoniums. 11. To Mr. Robinson, gardener to J. Simpson, Esq., Thames Bank, Pimlico, for six new varieties of Pelargonium in 8-inch pots. 12. To Mr. Gaines, for the same. 13. To Mr. Cock, F.H.S., for six varieties of Pelargonium in 11-inch pots. 14. To Mr. Gaines, for the same. 15. To Mr. Green, gardener to Sir E. Antrobus, Bart., F.H.S., for a collection of Greenhouse Azaleas, in six varieties. 16. To Mr. Cole, for Aphelexis purpurea. 17. To Mr. Bruce, for the same. 18. To Messrs. Veitch and Son, for Lisianthus pulcher.

The Large Silver Medal: 1. To Messrs. Pamplin, for a collection of fifteen Stove and Greenhouse Plants. 2. To Mr. Clark, gardener to W. Block, Esq., Muswell Hill, for a collection of six Stove and Greenhouse Plants. 3. To Mr. Jack, gardener to R. G. Loraine, Esq., Wallingford, for six species of Exotic Orchids. 4. To Mr. May, gardener to E. Goodhart, Esq., Langley Park, Beckenham, for nine varieties of Cape Heath. 5. To Mr. May, gardener to Mrs. Lawrence, F.H.S., for Erica vestita coccinea. 6. To Mr. Stains, of Middlesex Place, New Road, for six species of Pelargonium. 7. To the same, for six new va-

rieties of the same in 8-inch pots. 8. To Mr. Wiggins, gardener to S. Sanders, Esq., Staines, for six varieties of the same in 11-inch pots. 9. To Mr. Gaines, F.H.S., for a collection of Calceolarias. 10. To Mr. Robinson, for a collection of Fancy Pelargoniums. 11. To Mr. Glendinning, F.H.S., for a collection of Statices. 12. To Messrs. Veitch and Son, for Mirbelia dilatata. 13. To Mr. May, gardener to Mrs. Lawrence, F.H.S., for Portlandia grandiflora. 14. To Mr. Ivison, gardener to the Duchess Dowager of Northumberland, F.H.S., for Curcuma Roscoeana. 15. To Mr. Davis, Oak Hill, East Barnet, for Noblesse Peaches. 16. To J. Bailey, Esq., Glanusk Park, for Queen Pine-Apples.

The Silver Knightian Medal: 1. To Mr. Pawley, of Bromley, Kent, for a collection of fifteen Stove and Greenhouse Plants. 2. To Mr. Jack, gardener to R. G. Loraine, Esq., for a collection of six Stove and Greenhouse Plants. 3. To Mr. Malyon, gardener to T. Brandram, Esq., for the same. 4. To Mr. Bruce, gardener to Boyd Miller, Esq., for Oncidium flexuosum. 5. To Mr. Knott, gardener to the Rev. C. Pritchard, F.H.S., for a collection of Achimenes. 6. To Mr. Taylor, gardener to J. Coster, Esq., of Streatham, for nine species of Cape Heath. 7. To Mr. Stains, for a collection of Fancy Pelargoniums. 8. To Mr. May, gardener to E. Goodhart, Esq., for Erica ventricosa alba. 9. To Mr. Ivison, gardener to the Duchess Dowager of Northumberland, F.H.S., for Echium fruticosum. 10. To Messrs. Veitch and Son, for Tetratheca verticillata. 11. To Mr. Smith, gardener to Mrs. Lawrence, F.H.S., for a collection of Nepenthes. 12. To Messrs. Henderson, Pine-Apple Place, for a collection of Calceolarias. 13. To Mr. Jack, for Posoqueria longiflora. 14. To Mr. Graham, gardener to Mrs. Smith, Bersted Lodge, Bognor, for Violet Hative Nectarines. 15. To Mr. Stent, gardener to W. Herbert, Esq., Clapham Common, for Black Hamburgh Grapes. 16. To Messrs. Veitch and Son, for the best-named collection of Plants (no error in twenty).

The Silver Banksian Medal: 1. To Mr. Glendinning, F.H.S., for a collection of fifteen Stove and Greenhouse Plants. 2. To Mr. Stanly, gardener to H. Berens, Esq., F.H.S., for a collection of six Stove and Greenhouse Plants. 3. To A. Rowland, Esq., F.H.S., for twelve varieties of Roses in pots. 4. To Mr. Roser, gardener to J. Bradbury, Esq., Streatham, for nine varieties of Cape Heath. 5. To Messrs. Henderson, Pine-Apple Place, for Pimelea Hendersonii.

6. To Mr. Epps, F.H.S., for Aphelexis purpurea grandiflora. 7. To Mr. Tyso, Wallingford, for a collection of Ranunculus. 8. To Mr. Glendinning, F.H.S., for Hoya imperialis. 9. To Mr. Cowell, gardener to F. R. Bedwell, Esq., Walthamstow, for Black Hamburgh Grapes. 10. To Mr. Foggo, gardener to the Marquis of Abercorn, for Figs. 11. To Messrs. Rollisson, for the second best-named collection of Plants (no errors in fifteen).

The Certificate of Merit: 1. To A. Rowland, Esq., F.H.S., for a collection of Roses, in twenty-five varieties. 2. To Mr. Green, gardener to Sir E. Antrobus, Bart., F.H.S., for nine varieties of Cape Heath. 3. To Mr. Malyon, gardener to T. Brandram, Esq., for Erica ventricosa superba. 4. To Mr. Epps, F.H.S., for Erica propendens. 5. To Messrs. Veitch and Son, for Hoya bella. 6. To Mr. Costar, Benson, Oxon, for a collection of Ranunculus. 7. To Mr. Gad, gardener to T. J. Lenox, Esq., Stamford Brook Lodge, New Road, for two Seedling Petunias, "Enchantress" and "Prince of Wales." 8. To Mr. Mylam, gardener to G. Rucker, Esq., F.H.S., for a New Odontoglossum. 9. To the same, for Phalænopsis rosea. 10. To the same, for the third best-named collection of Plants (one error in twenty).

June 12, 1849. (Regent Street.)

Lecture. Dr. Lindley delivered his third Lecture on "Leaves and their Importance in the General Economy of a Plant" this day. The principal topics discussed on this occasion were, the nature of leaves, their anatomy, vitality, and varied forms; the processes of vegetation carried on in them by exhaustion, absorption, assimilation, and nutrition; the rationale of ventilation, and the application of the facts thus explained to the various operations in gardening.

Specimens of the following plants were sent from the Society's Garden.—Statice mucronata, Abronia umbellata, Philadelphus Mexicanus, Mahornia incisa, Wulfenia Amherstiæ, and Pentstemon azureus.

June 26, 1849. (Regent Street.)

Elections. Sir J. W. Ramsden, Bart., Buckden, Skipton, Yorkshire, and 6, Upper Brook Street; G. Harcourt, Esq., M.P., 5, Carlton Terrace; R. B. Byass, Esq., Westwood Cottage, Sydenham; W. W. Saunders, Esq., East Hill, Wandsworth; and Mr. Hurst, Leadenhall Street.

LECTURE. Dr. Lindley delivered a Lecture on "The Stem, whether regarded as Timber or as a Means of Propagation; together with the circumstances which hasten or defer its Destruction by Decay." The importance of the stem as a source of food to the young organs, and as the seat of buds through whose agency alone propagation by the stem can be effected, was discussed. The true principles of propagation were also explained, together with a variety of questions relating to the decay of timber, and the proper season for felling it. Numerous instructive specimens in illustration of the effects upon timber of barbarous pruning were placed before the meeting.

July 11, 1849. (GARDEN EXHIBITION.)

The day was beautifully fine, the Gardens at Chiswick House, which through the liberality of the Duke of Devonshire were again thrown open to the visitors, were delicious, and the exhibition of Fruit and Flowers one of the best which has yet been seen in July. The fruit growers vindicated their claim to rank with the cultivators of flowers; very little was of inferior quality, a great deal was excellent, and some was admirable. As to the Strawberries from the Speaker's Garden at Heckfield, it was admitted by the best judges that no such British Queens and Eleanors had ever been seen before. The number of visitors, exclusive of exhibitors, was 7338.

The AWARD was as follows:—

The Certificate of Honour: To Mr. May, gardener to Mrs. Lawrence, F.H.S., for a collection of thirty Stove and Greenhouse Plants.

The Large Gold Medal: 1. To Mr. Cole, gardener to H. Colyer, Esq., of Dartford, for a collection of thirty Stove and Greenhouse Plants. 2. To Mr. Mylam, gardener to S. Rucker, Esq., jun., F.H.S., for twenty species of Exotic Orchids. 3. To Mr. Dobson, gardener to Mr. Beck, F.H.S., for six new varieties of Pelargonium, in 8-inch pots.

The Gold Knightian Medal: 1. To Mr. Green, gardener to Sir E. Antrobus, Bart., F.H.S., for a collection of fifteen Stove and Greenhouse Plants. 2. To Mr. Williams, gardener to C. B. Warner, Esq., F.H.S., for twenty species of Exotic Orchids. 3. To Mr. Plant, gardener to J. H. Schröder, Esq., F.H.S., for ten species of the same. 4.

To Mr. Mylam, gardener to S. Rucker, Esq., jun., F.H.S., for fifteen varieties of Cape Heath. 5. To Mr. Epps, F.H.S., for the same.

The Gold Banksian Medal: 1. To Mr. Taylor, gardener to J. Coster, Esq., of Streatham, for a collection of fifteen Stove and Greenhouse Plants. 2. To Mr. Dobson, gardener to Mr. Beck, F.H.S., for ten species of Exotic Orchids. 3. To Mr. Smith, gardener to W. Quilter, Esq., Norwood, for fifteen varieties of Cape Heath. 4. To Messrs. Fairbairn, Clapham, for the same.

The Large Silver Gilt Medal: 1. To Mr. Pawley, Bromley, Kent, for a collection of fifteen Stove and Greenhouse Plants. 2. To Mr. Jack, gardener to R. G. Loraine, Esq., of Wallington, Surrey, for a collection of six Stove and Greenhouse Plants. 3. To Messrs. Rollisson, of Tooting, for ten species of Exotic Orchids. 4. To Mr. Jack, for six varieties of Exotic Orchids. 5. To Mr. Cole, gardener to H. Colyer, Esq., for fifteen varieties of Cape Heath. 6. To Mr. Green, gardener to Sir E. Antrobus, Bart., F.H.S., for nine varieties of the same. 7. To Mr. Stanly, gardener to H. Berens, Esq., F.H.S., for six *distinct species* of Pelargonium, exhibiting superior cultivation. 8. To the same, for Tall Cacti in flower. 9. To Mr. Stains, of Middlesex Place, New Road, for six new varieties of Pelargonium, in 8-inch pots. 10. To Mr. Parker, gardener to J. H. Oughton, Esq., of Roehampton, for six varieties of Pelargonium, in 11-inch pots. 11. To Mr. Gaines, F.H.S., for the same. 12. To the same, for six fancy Pelargoniums. 13. To Messrs. Veitch, Exeter, for Cycnoches barbatum. 14. To Mr. Ivison, gardener to the Duchess Dowager of Northumberland, F.H.S., for a collection of Uncommon Tropical Fruits.

The Certificate of Excellence: 1. To Mr. Bruce, gardener to Boyd Miller, Esq., Tooting, for a collection of six Stove and Greenhouse Plants. 2. To the same, for six species of Exotic Orchids. 3. To Mr. Dobson, gardener to Mr. Beck, F.H.S., for a collection of Achimenes. 4. To Messrs. Lane and Son, Great Berkhampstead, for a collection of Roses, in fifty varieties. 5. To Mr. Taylor, gardener to J. Coster, Esq., for nine varieties of Cape Heath. 6. To Mr. Stains, of Middlesex Place, New Road, for six *distinct species* of Pelargonium, exhibiting superior cultivation. 7. To Mr. Green, gardener to Sir E. Antrobus, Bart., F.H.S., for Tall Cacti, in flower. 8. To

Mr. Ivison, gardener to the Duchess Dowager of Northumberland, F.H.S., for Leschenaultia splendens. 9. To Mr. Robinson, gardener to J. Simpson, Esq., Thames-bank, Pimlico, for six new varieties of Pelargonium, in 8-inch pots. 10. To Mr. Bragg, Slough, for the same. 11. To Mr. Riddell, gardener to F. Ashby, Esq., Staines, for six varieties of Pelargonium, in 11-inch pots. 12. To Mr. Stains, for six Fancy Pelargoniums. 13. To Messrs. Rollisson, Tooting, for Metrosideros polymorpha. 14. To Mr. Elliott, gardener to J. B. Boothby, Esq., F.H.S., for a Plant of the Musa Cavendishii.

The Large Silver Medal: 1. To Mr. Glendinning, F.H.S., for a collection of six Stove and Greenhouse Plants. 2. To Messrs. Henderson, Pine-apple Place, Edgeware Road, for ten species of Exotic Orchids. 3. To Mr. Knott, gardener to the Rev. C. Pritchard, F.H.S., for a collection of Achimenes. 4. To Messrs. Veitch and Son, for Saccolabium Blumei. 5. To Mr. Parker, gardener to J. H. Oughton, Esq., for six distinct species of Pelargonium, exhibiting superior cultivation. 6. To Mr. May, gardener to Mrs. Lawrence, F.H.S., for Fuchsia Corallina. 7. To Messrs. Paul, Cheshunt, for a collection of Roses in fifty varieties. 8. To Mr. Parsons, gardener to A. George, Esq., Enfield, for the same in twenty-five varieties. 9. To Mr. May, gardener to E. Goodhart, Esq., of Beckenham, for nine species of Cape Heath. 10. To Mr. Gaines, F.H.S., for six new varieties of Pelargonium, in 8-inch pots. 11. To Mr. Robinson, gardener to J. Simpson, Esq., for six Fancy Pelargoniums. 12. To Mr. Glendinning, F.H.S., for a collection of Statices. 13. To Mr. May, gardener to E. Goodhart, Esq., for Roella ciliata. 14. To Mr. Williams, gardener to C. B. Warner, Esq., F.H.S., for a collection of Ferns. 15. To Messrs. Veitch and Son, Exeter, for a variety of Cypripedium barbatum. 16. To the same, for a collection of Conifers. 17. To Mr. Jones, gardener to Sir J. J. Guest, Bart., F.H.S., for a Queen Pine-Apple. 18. To Mr. Fleming, gardener to his Grace the Duke of Sutherland, F.H.S., for a Providence Pine-Apple, weighing 10 lbs. 4½ oz. 19. To Mr. Smith, gardener to S. Ricardo, Esq., Titness Park, Sunning Hill, for Grapes in pots. 20. To Mr. G. Hayward, gardener to G. Goodman, Esq., Roundhay, near Leeds, for Black Hamburgh Grapes. 21. To Mr. Chapman, South Lambeth, for the same. 22. To Mr. Fleming, for Muscat Grapes. 23. To Mr. Toy, Oatlands Palace Gardens,

Weybridge, for the same. 24. To Mr. Drummond, gardener to C. H. Leigh, Esq., of Pontypool Park, Monmouthshire, for a Rough-leaved Cayenne Pine-Apple, weighing 7 lbs. 3 oz.

The Silver Knightian Medal: 1. To Messrs. Pamplin, of Walthamstow, for a collection of six Stove and Greenhouse Plants. 2. To Mr. Stanly, gardener to H. Berens, Esq., F.H.S., for the same. 3. To Mr. Smith, gardener to Mrs. Lawrence, F.H.S., for ten species of Exotic Orchids. 4. To Mr. Francis, of Hertford, for a collection of Roses in fifty varieties. 5. To Mr. Terry, gardener to Lady Puller, Youngsbury, Herts, for the same, in twenty-five varieties. 6. To the same, for a collection of Yellow Roses. 7. To Messrs. Lane, for the same. 8. To Messrs. Veitch and Son, for fifteen varieties of Cape Heath. 9. To W. Gregory, Esq., F.H.S., for a Fuchsia grafted with fifteen different sorts. 10. To Mr. Green, gardener to Sir E. Antrobus, Bart., F.H.S., for Leschenaultia formosa. 11. To Messrs. Veitch and Son, for Nepenthes sanguinea. 12. To Mr. Taylor, gardener to J. Coster, Esq., for a collection of Ferns. 13. To Messrs. Veitch and Son, for a new species of Ruellia from Peru. 14. To Mr. Ivison, gardener to the Duchess Dowager of Northumberland, for Oncidium luridum. 15. To Messrs. Henderson, for Kalosanthes nitida. 16. To Mr. Ward, Woolwich, for a collection of Carnations. 17. To Mr. Norman, of the same place, for a collection of Picotees. 18. To Mr. Riddell, gardener to F. Ashby, Esq., of Staines, for a collection of Achimenes. 19. To Mr. Cole, gardener to H. Colyer, Esq., for the best-named collection of Plants (no error in fifteen). 20. To Mr. Spencer, gardener to the Marquis of Lansdowne, F.H.S., for a Queen Pine-Apple. 21. To the same, for a Providence Pine-Apple, weighing 9 lbs. 9 oz. 22. To Mr. Turnbull, gardener to his Grace the Duke of Marlborough, F.H.S., for a bunch of West's St. Peter's Grapes, weighing 4 lbs. 7½ oz. 23. To Mr. Toy, of Oatlands Palace Gardens, Weybridge, for a bunch of Muscat of Alexandria Grapes, weighing 1 lb. 6 oz. 24. To Mr. Holmes, gardener to S. Garrard, Esq., Putney Heath, for Black Hamburgh Grapes. 25. To Mr. Toy, for the same. 26. To Mr. Rust, gardener to J. Maclaren, Esq., F.H.S., for Muscat Grapes. 27. To Mr. Turnbull, for West's St. Peter's Grapes. 28. To Mr. Snow, gardener to the Earl de Grey, F.H.S., for Violette Hative Peaches. 29. To Mr. Parker, gardener to J. H. Oughton, Esq., Roehampton, for Nectarines. 30. To Mr.

Monro, gardener to Mrs. Oddie, for the heaviest Melon, "Hatfield Green-flesh," weighing $7\frac{3}{4}$ lbs. 31. To Mr. Gadd, of Betchworth Castle, for the second heaviest Melon, "Cantaloup," weighing $3\frac{1}{2}$ lbs. 32. To Mr. Bundy, gardener to Lord Dynevor, for the best-flavoured Melon, "Bromham Hall."

The Silver Banksian Medal: 1. To Mr. Williams, gardener to C. B. Warner, Esq., F.H.S., for a collection of six Stove and Greenhouse Plants. 2. To Mr. Hamp, gardener to J. Thorne, Esq., South Lambeth, for the same. 3. To Mr. Foster, Edgeware, for a collection of Roses, in fifty varieties. 4. To Mr. Woods, gardener to F. Wigg, Esq., St. Alban's, for the same, in twenty-five varieties. 5. To Mr. Tivey, gardener to R. Wignelin, Esq., of Golding, Herts, for the same. 6. To Mr. Francis, Hertford, for a collection of Yellow Roses. 7. To Mr. Robinson, gardener to J. Simpson, Esq., for a Fuchsia, "Sir Robert Peel." 8. To Mr. E. G. Henderson, F.H.S., for six distinct species of Pelargonium, exhibiting superior cultivation. 9. To Mr. W. Ambrose, of Battersea, for new Hybrid Pelargoniums. 10. To Mr. Norman, of Woolwich, for a collection of Carnations. 11. To Mr. Ward, of the same place, for a collection of Picotees. 12. To Mr. Norman, for a collection of Pinks. 13. To Mr. Wooley, gardener to H. B. Ker, Esq., Cheshunt, for Oncidium leucochilum. 14. To Mr. Green, gardener to Sir E. Antrobus, Bart., F.H.S., for Aërides odoratum. 15. To Messrs. Lane, for a collection of Achimenes. 16. To Mr. Ivison, gardener to the Duchess Dowager of Northumberland, F.H.S., for Espeletia argentea. 17. To the same, for Balsamina repens. 18. To Mr. Thomson, of Hammersmith, for three specimens of Kalosanthes coccinea. 19. To Messrs. Veitch and Son, for a new Cryptomeria. 20. To Mr. Masters, F.H.S., for a collection of Ferns. 21. To Mr. Smith, gardener to Mrs. Lawrence, F.H.S., for the second best-named collection of Plants (no error in fifteen). 22. To Mr. Ogle, gardener to the Earl of Abergavenny, for a Queen Pine-apple. 23. To Mr. Jones, gardener to Sir J. J. Guest, Bart., F.H.S., for a Providence Pine-apple, weighing 7 lbs. 14 oz. 24. To Mr. Dytch, gardener to James Taylor, Esq., F.H.S., for Black Hamburgh Grapes. 25. To Mr. Lushey, gardener to J. Hill, Esq., Streatham, for Black Prince Grapes. 26. To Mr. Turnbull, gardener to the Duke of Marlborough, F.H.S., for Muscat Grapes. 27. To Mr. Spencer, gardener to the Marquis of Lansdowne, F.H.S., for Peaches. 28. To Mr.

Ferguson, of Aylesbury, for the same. 29. To Mr. Turnbull, for Nectarines. 30. To Mr. Ferguson, of Aylesbury, for the same. 31. To Mr. Snow, gardener to the Earl de Grey, F.H.S., for Black Tartarian Cherries. 32. To the same, for Elton Cherries. 33. To Mr. Meyers, of Brentford, for Black Circassian Cherries. 34. To the same, for Bigarreau Cherries. 35. To Mr. Elphinstone, gardener to the Right Hon. the Speaker, for British Queen and Eleanor Strawberries. 36. To Mr. Lydiard, of Batheaston, for the same. 37. To Mr. Bruce, gardener to Boyd Miller, Esq., for the second best-flavoured Melon, "Cuthill's improved Scarlet-fleshed."

The Certificate of Merit: 1. To Mr. Herman, Denham, Bucks, for a collection of Roses, in fifty varieties. 2. To Mr. Slowe, gardener to W. R. Baker, Esq., F.H.S., for the same, in twenty-five varieties. 3. To Messrs. Paul, for a collection of Yellow Roses. 4. To Mr. Bruce, gardener to Boyd Miller, Esq., of Tooting, for Erica depressa. 5. To Mr. Bragg, of Slough, for a collection of Carnations. 6. To the same, for a collection of Picotees. 7. To Mr. E. G. Henderson, F.H.S., for Abronia umbellata. 8. To Messrs. Veitch and Son, for Cephalotus follicularis. 9. To Messrs. Henderson, for Achimenes Ghiesbreghtiana. 10. To Mr. Glendinning, F.H.S., for Gloxinia Wortleyana. 11. To Messrs. Veitch and Son, for Mitraria coccinea. 12. To Messrs. Henderson, for a collection of Petunias. 13. To Mr. Salter, F.H.S., for a Fuchsia, "Corymbiflora alba." 14. To Mr. Epps, F.H.S., for the third best-named collection of Plants (no error in fifteen). 15. To Mr. Taylor, gardener to J. Coster, Esq., for Black Hamburgh Grapes. 16. To Mr. Fleming, gardener to the Duke of Sutherland, F.H.S., for the same. 17. To Mr. Bassett, gardener to T. B. Herring, Esq., Finchley, for the same. 18. To Mr. Turnbull, gardener to the Duke of Marlborough, F.H.S., for Peaches. 19. To Mr. Monro, gardener to Mrs. Oddie, for Nectarines. 20. To Mr. Whiting, gardener to H. T. Hope, Esq., F.H.S., for Black Tartarian Cherries. 21. To Mr. Woods, gardener to F. Wigg, Esq., for British Queen Strawberries. 22. To Mr. Shepherd, of Deptford, for Myatt's Eleanor Strawberries. 23. To Mr. Whiting, for the third best-flavoured Melon, "Egyptian Green-fleshed."

*** A prize of the value of Ten Pounds was awarded to Mr. Fleming, gardener to the Duke of Sutherland, F.H.S., for the finest collection of Fruit.

July 3, 1849. (REGENT STREET.)

LECTURE. Dr. Lindley's Lecture to-day, the fifth of the series, was principally confined to the structure and use of the organs which constitute the flower, and to the circumstances which are most favourable or unfavourable to its complete formation, its alteration, its colour, and the production of fruit, which production is the great end of the existence of a flower. The cause of fruit being blind, of grapes not setting, of flowers falling from the branches, and of similar accidents, together with the history of monstrous or double fruits, were among the questions discussed on this occasion.

Specimens of Acropera Batemanni and another species of the genus were exhibited by Mr. Lane, jun.

July 17, 1849. (REGENT STREET.)

ELECTION. J. Brown, Esq., Rossington, near Doncaster, Yorkshire.

AWARDS. *Banksian Medal:* To Mr. Jones, gardener to Sir J. J. Guest, Bart., of Dowlais House, Glamorganshire, for four Queen Pine Apples, nicely swelled, well-grown fruit, whose weights were respectively 4 lbs. 5 oz., 4 lbs. 8 oz., 4 lbs. 9 oz., and 4 lbs. 12 oz.

Dr. Lindley delivered his concluding Lecture "on the Diseases of Plants, the nature of Vegetable Affections, their Causes, whether constitutional or local, and the Remedies which experience had pointed out, or that reason suggested." The nature and mode of action of Mildew plants, by which so much injury is committed, was also explained by drawings and diagrams.

August 7, 1849. (REGENT STREET.)

AWARDS. *Banksian Medals:* To Messrs. Fairbairn, of Clapham, for a collection of large and finely-cultivated Cape Heaths, consisting of three varieties of E. ampullacea, Irbyana, Lee's tricolor, and infundibuliformis. To Mr. Jones, gardener to Sir J. J. Guest, Bart., of Dowlais House, Glamorganshire, for a Queen Pine Apple, beautifully swelled and handsome, weighing 5 lbs. 5 oz. To Mr. Monro, gardener to Mrs. Oddie, of Colney House, St. Alban's, for eighteen fine-looking fruit of his hybrid Egyptian green-fleshed Melon; the average weight of these fruit was about 5 lbs., but one weighed 9 lbs. 3½ oz. It was stated that 28 fruit had been cut from under 5 lights;

they had been produced in a brick pit with the remains of dung and leaves which had formed a hotbed for early potatoes. On one of the fruit being cut it proved not to be first-rate in flavour. To Mr. Davis, gardener to the Earl of Tyrconnel, at Kiplin, for a bunch of black Hamburgh Grapes, finely swelled and perfectly ripe, but insufficiently coloured, and much spoiled by travelling; it weighed 4 lbs. Another accompanying it weighed 2 lbs. 1 oz.

Certificates of Merit: To Mr. Turnbull, gardener to the Duke of Marlborough, at Blenheim, for a box of black Hamburgh Grapes, medium sized bunches, well-coloured and covered with bloom. To Messrs. Veitch, for a new Peruvian Oxalis, concerning which Dr. Lindley has given the following account:—"This plant, the O. elegans of Humboldt, had been exhibited on several previous occasions without exciting much attention. It was regarded as a pretty plant, but not as one of striking merit. It has now, however, quadrupled the size of its foliage, doubled that of its flowers, and acquired a brilliancy of colour which places it in the first rank among border flowers. This change is the effect of cultivation. Cramped in a flower-pot, and coddled in a frame, it was puny and worthless; planted in the open border, and fed abundantly with air and dew, it has become a gem of the purest water. Mr. Veitch believes the species to be hardy; he has grown it for two years in the open ground in his nursery at Exeter, and he received it from the mountains behind Loxa in Peru, where his collector, W. Lobb, obtained it. We take it to be about as hardy as O. Bowiei. The leaflets are firm, fleshy, of a dark rich green, and stained with purple on the under side. From the centre of these rises a stalk about 9 inches high, bearing a truss of 5 or 6 deep rose-coloured flowers, with a rich dark purple eye. In general effect they are not unlike Viscaria oculata, only much handsomer. Till experience shall have been obtained of the real habits of this species, it will be prudent to give it some slight shelter in the winter. We believe, however, that dryness will be more important to it than warmth at that season. As a rock plant it promises to be extremely useful; for a gay bed in a summer garden it will be invaluable. Nor are these its only merits, for it stands well in a dry drawing-room when cut and mixed with other flowers, and will open perfectly with no more light than that of an ordinary day." To Messrs. Wrench, for two well-managed Fuchsias, from a little greenhouse on the top of their warehouse at London

Bridge. To Mr. Turner, of Slough, for two boxes of most beautiful Carnations and Picotees.

MISCELLANEOUS SUBJECTS OF EXHIBITION. From Mr. Moore, Apothecaries' Garden, Chelsea, Plumbago Larpentæ, a blue-flowered Leadwort, which has excited much interest during the past year in consequence of its not having fulfilled the expectations which had been formed of it. It was suggested that as it was discovered growing on the walls of Shanghae, whose winters are more severe than ours, it might be found to succeed better planted out of doors on the shelves of rockwork, or in some well-drained warm border, where it would receive some shelter. Messrs. Henderson, of the Wellington Road Nursery, sent a plant of the New Californian Pentstemon cordifolius, and a collection of Verbena flowers. An exhibition of Verbenas was also contributed by Mr. Harrison, of Richmond. Mr. Turner sent a pan of Heartsease. A dish of Brunswick Figs was communicated by Mr. Turnbull, and Mr. Jones had three Queen Pine Apples, weighing respectively 4 lbs., 4 lbs. 8 oz., and 4 lbs. 13 oz.

NOVELTIES FROM THE SOCIETY'S GARDEN. Aërides quinquevulnera, well flowered; the small-leaved variety of Hoya imperialis; the pretty apricot-coloured Cafferland Tritonia aurea; Abronia umbellata; a white and a yellow Portulaca; Vilmorin's pale variety of Thunbergia alata; Pentstemon cordifolius, a brownish orange-flowered shrub, which promises to prove an acquisition; two plants of the beautiful red-flowered Zauschneria californica, which is expected to be hardy; and a small plant of Mimulus tricolor, not a true Mimulus, but so called: its flowers are pretty, but it is too delicate and difficult to cultivate to become a general favourite. It may however prove useful in the hands of the hybridist.

BOOKS PRESENTED.

The Journal of the Royal Geographical Society, Vol. XIX., Part 1. From the Society.
The Journal of the Royal Asiatic Society, Vol. II., Part 1, and Vol. XII., Part 1. From the Society.
The Quarterly Journal of the Geological Society, No. 18. From the Society.
Transactions of the Zoological Society of London, Vol. III., Part 6. Proceedings of the Society, Nos. 182 to 189 inclusive, and Report of the Council and Auditors, April 29, 1848. From the Society.
Proceedings of the American Philosophical Society, Vol. V., No. 41. From the Society.
The Journal of the Royal Agricultural Society, Vol. X., Part 1. From the Society.
Comptes Rendus des Séances de l'Académie des Sciences à Paris, Tome XXVIII. and Tome XXIX., No. 1, and Tables des Comptes Rendus, Tome XXVII. From the Academy.

Verhandlungen der k.k. Landwirthschafts Gesellschaft in Wien, Vol. V., Parts 1 and 2. From the Agricultural Society of Vienna.
The Athenæum for April, May, June, and July. From the Editor.
The Cultivation of the Grape and Manufacture of Wine; also Character and Habits of the Strawberry Plant. By N. Longworth. From the Author.
Report on the Progress of the Culture of the China Tea Plant in the Himalayas. By Dr. Royle. From the Author.
Meteorologische Beobachtungen Angestellt auf Veranstaltung der Naturforschenden Gesellschaft in Zürich, 1837 to 1846, and January to December, 1848. Denkschrift zur Feier des hundertjährigen Stiftungfestes der Naturforschenden Gesellschaft in Zürich, a.m. 30 November, 1846. Mittheilungen der Naturforschenden Gesellschaft in Zürich, Part I., Nos. 1 to 13, and Part XIV., Nos. 14 to 26. From the Physical and Natural History Society of Zürich.
Archives du Muséum d'Histoire Naturelle, Tome IV. From the Museum.
Bulletins du Cercle pratique d'Horticulture et de Botanique du Département de la Seine Inférieure, Tomes I., II., III., and IV. From the Horticultural Society of Rouen.

September 4, 1849. (REGENT STREET.)

AWARDS. *Knightian Medal:* To Messrs. Henderson, of Pine-apple Place, for Pleroma elegans, an exceedingly handsome, cool Greenhouse plant. In this instance it was clothed with large, round, bright violet blossoms, which, unlike those of most Melastomads, remain a long time in beauty; also for the pretty New Holland shrub Babingtonia Camphorosmæ; a new orange scarlet flowered Begonia, from Bolivia, called cinnabarina, one of the handsomest of all Begonias; and the larger variety of Nerine Fothergillii, a plant nearly related to the Guernsey Lily, and for which the Guernsey people would do well to substitute it, for it is much more beautiful than the Guernsey Lily, and would succeed under the same kind of treatment.

Banksian Medal: To Mr. Leach, gardener to S. Rucker, Esq., F.H.S., for a well-flowered Statice imbricata, and for a nice plant of Erica Irbyana, grown in a small pot and in an easy, graceful manner, almost without stakes. To Mr. Mackay, gardener to C. Leach, Esq., of King's Road, Clapham Park, for beautifully flowered plants of Brunsvigia Josephinæ, together with Amaryllis blanda, and two species of Hæmanthus. An account of the manner in which these were cultivated will be found in another page. To Mr. Plant, gardener to J. H. Schröder, Esq., F.H.S., for a nice specimen of Miltonia candida, and for two plants of Æschynanthus Lobbianus in wire baskets, in which they appear to better advantage than in pots. To Mr. Bundy, gardener to Lord Dynevor, Dynevor Castle, Llandillo, for a fruit of the Bromham Hall Melon, weighing 2 lbs. 4 oz. This is a netted, round, medium-sized, green-fleshed Melon of the very best flavour, for which it received the first prize at the last exhibition in the Garden of the Society in July, 1849.

Certificates of Merit : To Mr. Ogle, Gardener to the Earl of Abergavenny, Eridge Castle, Tunbridge Wells, for a fruit of the Dampsha Melon, weighing 4 lbs. 11 oz. This is a netted, oval, green-fleshed Winter Melon, well flavoured, and remarkable for its keeping properties after it is cut. Some account of it appeared in the Transactions of the Society, at p. 211, Vol. IV. To Mr. Chapman, Gardener to J. B. Glegg, Esq., F.H.S., for a Black Jamaica Pine-apple, exhibited under the name of "Montserrat," weighing 4 lbs. 7 oz. To Mr. Ogle, for a handsomely swelled Ripley Queen Pine, weighing 4 lbs. 8½ oz. To Mr. Slowe, Gardener to R. W. Baker, Esq., F.H.S., for two bunches of Grapes, weighing respectively 3 lbs. 12 oz. and 4 lbs., but ill coloured and unequally swelled; they were the produce of Vines planted in 1847. To Mr. Turner, F.H.S., of the Royal Nursery, Slough, for twenty-four varieties of Fancy Dahlias, whose names are as follows:—M. Chereau, Vicomte de Ressequier, Œillet Parfait, Conspicua, Belle de Nogent, Picotee, Herminia, Miss Jane, M. Affre, Striata perfecta, Keepsake, Comte de Flandres, De Bureau, General Cavaignac, Empereur de Maroc, Jenny Lind, Nonsuch, Sunbeam, Madame Eberth, Rainbow, Miss Stevens, Roi de Points, Picotee, and Mrs. Labouchere.

Miscellaneous Subjects of Exhibition. From Messrs. Henderson, of Pine-apple Place, the little-known white-flowered Ipomæa pandurata, a North American species, almost, if not quite hardy; and a tall Acacia, called oleæfolia elegans. From Messrs. Veitch, two specimens of their new Gesnera picta, a luxuriant growing species with orange scarlet blossoms, not particularly striking. Also a seedling Heath raised by Mr. Story, with pale green flowers tinged with pink. From Mr. Leach, gardener to S. Rucker, Esq., Æschynanthus Lobbianus; Hoya campanulata, a free flowering species, and fragrant at night; and Erica infundibuliformis and Shannoni. From Messrs. Fairbairn, of Clapham, large and well-managed plants of Erica retorta major, mutabilis, Vernonii superba, and cut specimens of their large-flowered variety of E. mammosa. From Mr. Jones, gardener to Sir J. J. Guest, Bart., F.H.S., for four Ripley Queen Pine-apples, all handsomely swelled, and weighing respectively 4 lbs. 3 oz., 4 lbs. 12½ oz., 4 lbs. 13 oz., and 5 lbs. 2½ oz. No medal was awarded to these, Mr. Jones having been recently rewarded for fruit of the same kind of excellence. From Mr. Willcox, gardener to the Earl of

Stamford, a seedling Pine, weighing 4 lbs. 3 oz., notwithstanding that it had been cut a fortnight or three weeks. In appearance it was something like an Enville. From Mr. Judson, of Richmond Villa, Brighton, a boxful of a seedling Grape called "the Richmond Villa Black Hamburgh." The bunches were small, well coloured and bloomed, and like the Hamburgh, except that the berries were more oval than those of that variety. From Mr. Burrow, gardener, Brough Hall, Yorkshire, some specimens of Royal George Peaches and Elruge Nectarines. From Mr. Monro, gardener to Lord Clarendon, at Grove Park, Watford, a beautiful dish of Figs, apparently the Brunswick. From Mr. Chapman, gardener to J. B. Glegg, Esq., F.H.S., a hybrid Melon between the Ispahan and the Hoosainee, a white-fleshed oblong fruit, weighing 11 lbs. 4 oz. It was inferior in flavour to both its parents. Also a green-fleshed Cabul Melon, weighing 10 lbs. 13 oz. And finally, from Mr. Culverwell, gardener to the Lady Augusta Milbank, Thorpe Perrow, an unripe Beechwood Melon, well grown, and weighing 4 lbs. 4 oz. Also a new Cucumber called "Thorpe Perrow Cucumber," a seedling from the Sion House, stated to be three weeks earlier than that variety.

NOVELTIES FROM THE SOCIETY'S GARDEN. A hybrid variety of Anemone japonica, produced between that sort and the white Indian A. vitifolia. The result was an improvement in the shape of the flowers, but they were much paler than those of the Japan Anemone. Also the beautiful lilac-flowered Abronia umbellata, which is scented in the evening; Pentstemon heterophyllus, a Californian species, with narrow leaves and pretty lilac pink blossoms; Begonia Fuchsioides and acuminata, grown in a cool greenhouse, where they flower profusely and acquire a degree of colour and beauty far beyond what they obtain when nursed in a warm stove.

The same establishment also furnished fruit of the Imperatrice and Downton Nectarines.

BOOKS PRESENTED.

Smithsonian Contributions to Knowledge, Volume the First, and Reports of the Smithsonian Institution. From the Institution.
Ampélographie Universelle, ou Traité des Cépages les plus estimés dans tous les Vignobles de quelque renom, par le Comte Odart. From the Author.
The Quarterly Journal of the Geological Society, Number 19. From the Society.
The Athenæum for August. From the Editor.